

SMALLPOX AND VACCINATION

HISTORICALLY AND MEDICALLY CONSIDERED :

An Inquiry

INTO THE

CAUSES OF THE RECENT INCREASE OF SMALLPOX,
AND THE MEANS FOR ITS PREVENTION.

Recd. 13/1

BY

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LONDON:

HATCHARD AND CO. 187 PICCADILLY.

MDCCCLX.

LONDON :
Printed by G. BARCLAY, Castle St. Leicester Sq.

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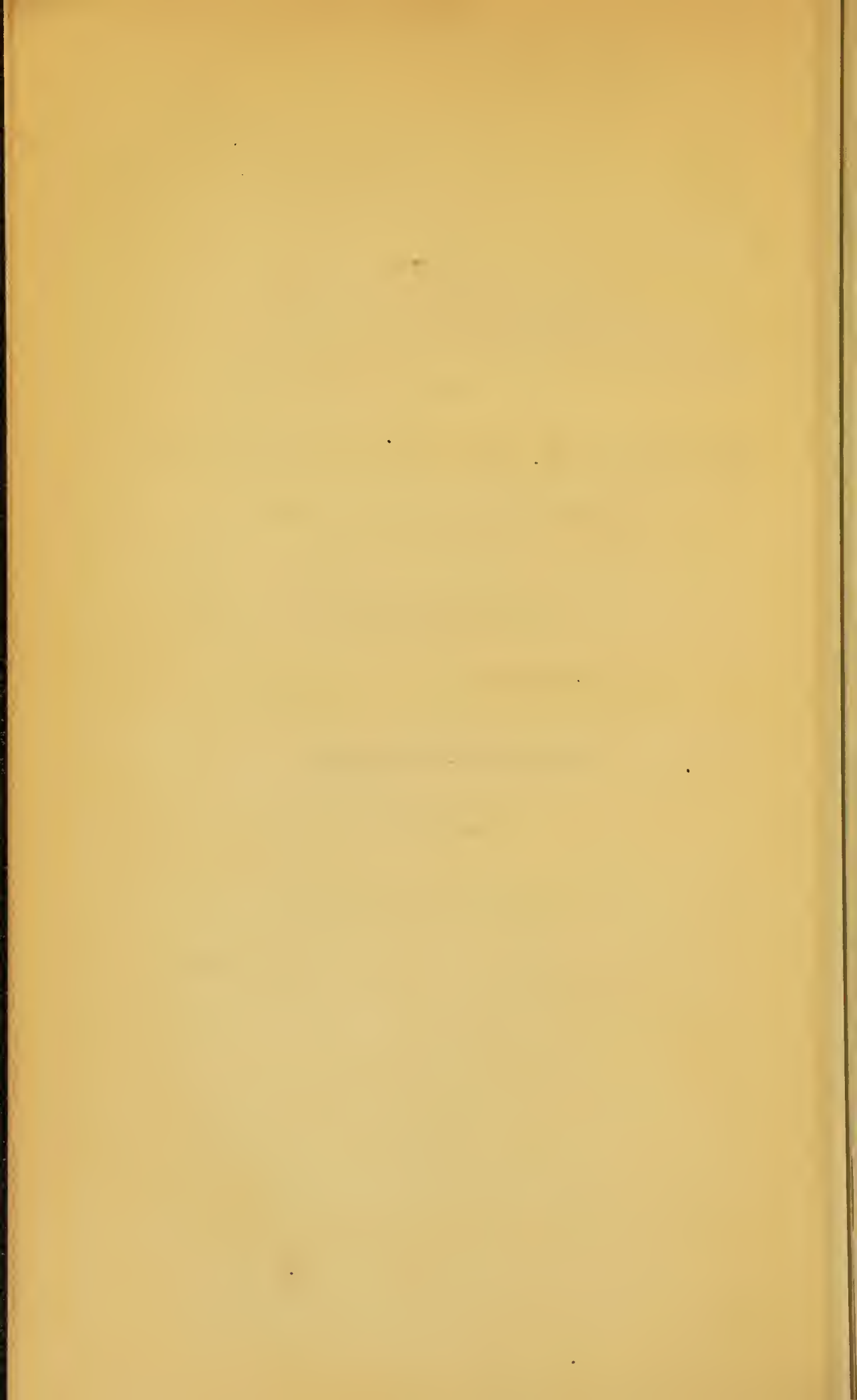
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INTRODUCTION.

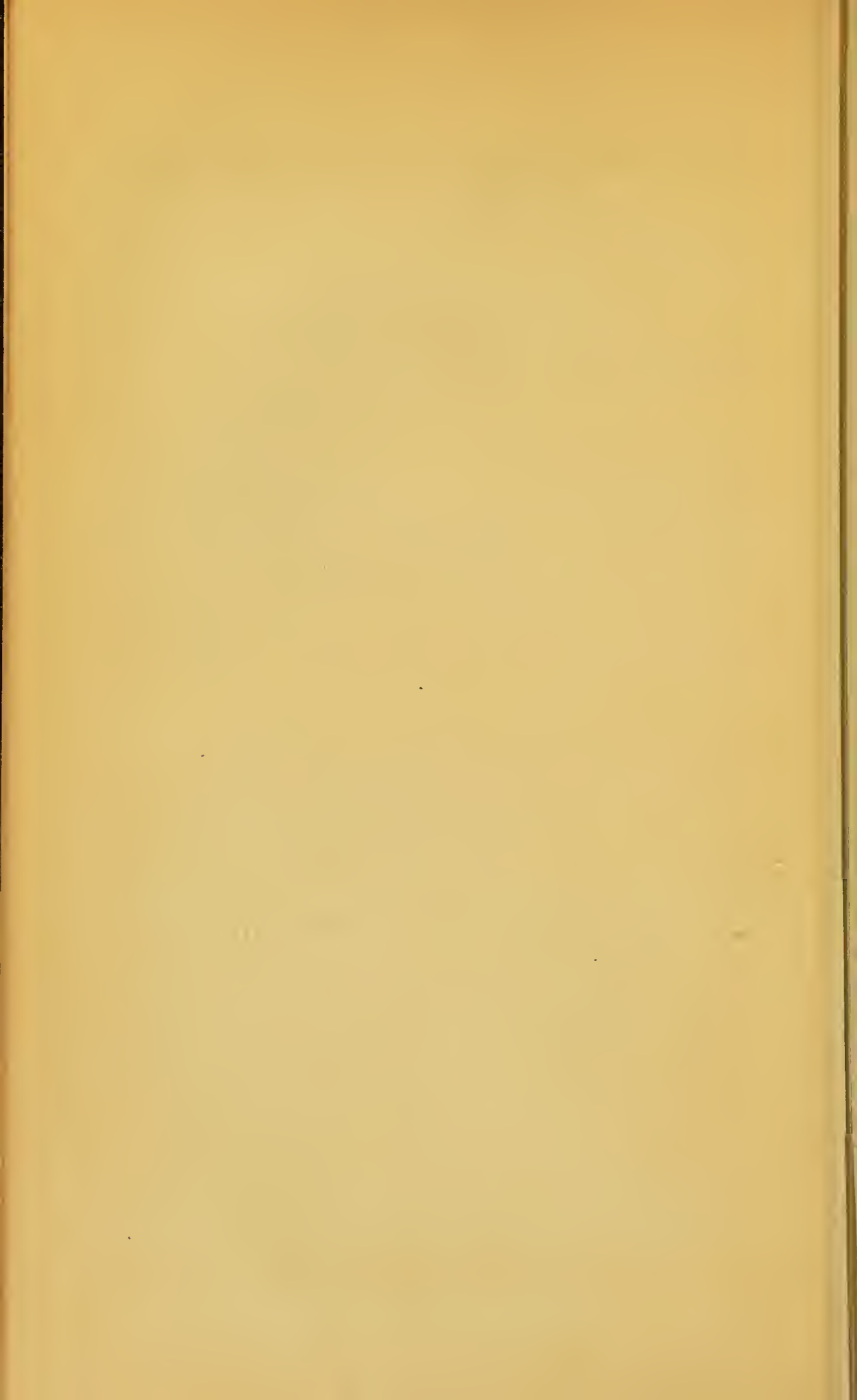
THE purpose of the following pages has been to develope, if possible, the causes of the increase of Smallpox, and to point out the means whereby Vaccination, its only sure preventive, may be restored to its pristine efficacy. To accomplish this, it is necessary to trace the history of Smallpox and that of Vaccination in its various phases. It is only by this means that the public mind can be brought to a full sense of the impending danger, and the necessity of immediate and energetic measures for the establishment of more efficient and general Vaccination than has been practised of late years. With this view I have endeavoured to collect and present to the reader, in a condensed and summary form, the pith and marrow of the information which is to be found on this subject. A mass of observation and experiment on the important subject of Smallpox and Vaccination has been collected by numerous observers and inquirers, but it is scat-

tered over an infinity of histories, treatises, reports, and statistical returns, for the most part unknown to, or inaccessible to the general public. A perfect mine of knowledge and information on this subject has been collected by Mr. Simon, the medical officer of the Privy Council, and communicated by him in his most valuable Report on Vaccination to the Board of Health in 1857, in another general Report in 1858, and a shorter one to the Privy Council in 1859. In availing myself of these, I cannot refrain from expressing my respect for the learning and industry, and the singular faculty for collecting and estimating evidence, which that gentleman has exhibited in his Reports, in all that relates to the history, the science, the statistics, and the laws of Vaccination, and for the enlightened zeal which evidently guides him in his efforts to organise an efficient system of Vaccination for this country.

But however valuable to the scientific inquirer these sources of knowledge may be, it would be vain to expect that the general reader should resort to them for information. Yet the subject is one, not merely of professional or scientific interest, but of the deepest moment to the public at large. The evil to be dealt with is one which cannot be met by medical science and treatment alone, but which it requires the action of government and legislation to overcome.

I have, therefore, sought to collect from the various sources of information, to which more particular reference will be made in the ensuing pages, and to bring under the public attention in the most condensed and readable form,

all the material facts connected with this important subject. From these the reader, whether professional or otherwise, will be able to draw his own conclusions, should he not agree with mine. My end will be sufficiently attained if I can succeed in fixing attention—more especially that of persons in authority—on the danger to which the country is exposed, and the means of averting it. The only merit which I can venture to claim is, that of having collected and supplied from various sources materials from which a sound opinion may be formed as to what is necessary to be done. If I have succeeded herein, my labour will be amply rewarded.



SMALLPOX AND VACCINATION

HISTORICALLY AND MEDICALLY CONSIDERED.

It may safely be asserted that of all the pestilences which have desolated mankind, none has been more fatally destructive than the disease popularly known by the name of Smallpox. Other epidemics, indeed, may possibly have surpassed it in destructiveness for a time, while sweeping over the districts of the earth exposed to their ravages. But, their visitation over, they have departed, either never to return, or only after intervals more or less prolonged. The Smallpox, on the other hand, in addition to its epidemic visitations, has permanently localised itself in every country it has visited, and assuming an endemic character, has remained ever ready, when atmospheric or other influences favoured its development and progress, to resume the more fatal form of a general epidemic, in the meantime silently carrying off a multitude of victims prematurely to the grave.

But that which painfully distinguishes Smallpox from the other pestilential scourges which have been permitted to devastate the world, is, that in a large proportion of cases it maims, mutilates, weakens, or permanently disfigures those whom it fails to destroy. Man in the pride

of his strength may suddenly be left in darkness or helplessness, and the glory of woman's beauty may be changed to loathsome or revolting hideousness. Scrofula, consumption, and other constitutional complaints, previously latent in the system, and which otherwise might ever have remained so, become developed and roused into activity. It has been calculated that, for a long time, no less than half a million of lives were annually cut off by this fell destroyer in Europe, and that one-fourth of the human race bore in blindness or other forms of suffering or disfigurement the traces of having been visited by this fearful enemy of our race.

Such was the state of things till the close of the last century, when a happy discovery, converted into an inestimable blessing by the profound sagacity and untiring zeal of our immortal countryman, brought comfort and relief to suffering humanity. By the general diffusion of Vaccination, Smallpox, if not extirpated, at all events was so far reduced, that the terrors it had before inspired gave place to a general feeling of security; and though its name did not disappear from among the causes of death recorded in the bills of mortality, the evil was so far controlled that it could no longer be numbered among the great plagues of the earth.

From this sense of security men have, within a recent period, been suddenly aroused by warning voices, which proclaimed that the enemy who was believed to be overcome had again arisen in renewed strength, and was creeping silently upon us with hourly increasing power. An increase in the annual number of deaths by Smallpox from 2277 in 1856, to 6460 in 1858, as shown by official records—and doubtless a greater amount in 1859, though I have been unable to learn the actual

number—is sufficient to justify those who are now endeavouring to arouse their fellow-citizens to a sense of the impending danger and to the necessity of taking prompt and efficient measures to stay the plague, by the return of which we are unhappily menaced.

At a moment when this messenger of Death again gives signs of renewed activity, it may not be unprofitable calmly to review the history of this great plague ; to recall what our forefathers have endured from it ; to trace from its first commencement to its complete establishment the great discovery of Jenner, which has so long protected us from the greatest scourge which has ever afflicted our race ; to prove the efficacy and value of that discovery by setting forth its results ; to recall the rules for its application laid down by its illustrious author ; and to discover, if possible, the causes from which the renewed vitality and energy of the disease are to be ascribed ; and if this should be found to arise from the defectiveness of the present system of Vaccination, to ascertain wherein that defectiveness consists, and by what means it is to be remedied.

It will, in the first place, be useful as well as interesting to give a short account of the origin and progress of this disease.

The question whether Smallpox was known to the ancient world, and if so to what extent, appears to be involved in considerable doubt. Dr. Hahn, at the early part of the eighteenth century, attempted to prove that the Greeks and Romans were acquainted with it. Dr. Willan and Dr. Baron also devoted much learning to the attempt to prove this to have been the fact.

Rhazes the Arabian, who wrote in the tenth century, expressly declares that this disease was well known to Galen, and in proof of this assertion cites three or four passages from the works of the Greek physician, which, however, seem to fall far short of establishing the assertion. Alexander Trallianus, who wrote in the sixth century, and who gives an account of the diseases then known, does not speak of this one; and the greater probability seems to be that it was not known either to the Greeks or Romans until after that time. Mr. Moore, the historian of Smallpox, says that it was known in China and India long before the time of Hippocrates; and there is every probability that it prevailed in those countries before it appeared in Syria and Arabia, and centuries before it was described by Rhazes.

Dr. Gregory, in his work on *Eruptive Fevers*, states that the first notice of a disease which looks like Smallpox is made by Procopius, in a chapter in his work *De Bello Persico*, wherein he relates that in the 18th year of the reign of Justinian, A.D. 544, "a great pestilence began in Egypt, at Pelusium; whence it took in the whole world: continually advancing, it left no lurking places, nor did it attack the same person a second time." This epidemic was more fully described by Evagrius, fifty years afterwards, when it was still raging. Dr. Gregory, in commenting on its symptoms, makes it doubtful whether it was the Smallpox, though he adds that, "within a short time of this period very unequivocal traces of the disease are to be met with in the countries bordering on the Red Sea, as we read of caliphs and caliphs' daughters being pitted." The year 568 or 569, when an Abyssinian army which was then besieging Mecca suddenly retreated on account of

the ravages of the Smallpox, is the date which is usually given for the first appearance of the disease in Arabia. Mr. Bruce relates that when at Masuah, on the borders of Abyssinia, he met with a manuscript in which the native writer gives a somewhat earlier date, namely, A.D. 522, as that of its first appearance. Dr. Mead, in his *Discourse on Smallpox and Measles*, states that a MS. in the University of Leyden gives an account of the first appearance of Smallpox in Arabia in 572 (the year in which Mahomet was born), the disease having been conveyed into that country by an Abyssinian army.

Ahron, a physician who practised in Alexandria in 622, treated of the diagnostics and the various kinds of the disease, and of the method of cure. In 640, during the reign of the Caliph Omar, when the Saracens overran Egypt, the disease caused great ravages, and there can be little doubt that it followed in the track of their armies.

Rhazes, however, was the first author for whose writings the profession seem to have respect who wrote fully and expressly on Smallpox. He, however, considered that disease and measles to be identical. It was afterwards described by other Arabian writers, and of these Avicenna has given a clearer description of it than any who preceded him. He distinguishes it from measles, and remarks on its contagious character. The Arabians were not more accurate than the Greeks or Romans in their delineations of the disease or their theories respecting it.

The first recorded case in Europe is probably that of Elfrida, daughter of Alfred the Great, and wife of Baldwin, earl of Flanders, A.D. 907. The next case to be met with in the monkish annals is that of Elfrida's grandson, Baldwin, who was carried off by fatal Small-

pox A.D. 961. It is exceedingly difficult to distinguish the spread of Smallpox during these early times in Europe, as it was confounded with other pestilences, though the Arabians had evidently recognised and described it. Mr. Moore says the plague is recorded to have visited France eleven times in the ninth, and six or seven times in the tenth century. Some of these visitations were unquestionably Smallpox. The pestilence of fire, of which horrible descriptions are given, may have been in some instances the Smallpox. The disease probably reached England towards the end of the ninth century, though Dr. Gregory says that there are, in the British Museum, Latin manuscripts older than the ninth century in which the word "Variola" appears. Between the eleventh and twelfth centuries, its spread was greatly extended by means of the great religious wars the Crusades, and the intercourse with the Eastern world to which they gave rise ; this being, says Dr. Mead, the only visible recompense which these religious expeditions brought back to their respective countries. Bernard Gordon, Professor of Medicine at Montpellier in 1285, mentions frequent epidemics of the disease during his lifetime. It was described by Gilbert and John of Gaddesden, in the reigns of our own kings Edward I. and II., though they evidently merely copied from the Arabians. Indeed, during the times immediately following the Crusades it must have prevailed over the greater part of Europe. It was not known until later in Lapland and Norway, and other northern countries ; the coldness and dryness of the air probably retarding its progress towards the north.

From Europe the disease was conveyed by the Spaniards to America. It devastated Mexico in 1527,

and from thence diffused itself with alarming violence throughout that continent. Its ravages were especially great within the tropics, where they are still peculiarly fatal among the dark-skinned races. Indeed the first visitation of the Smallpox in those new and isolated countries was more terrible than the ravages of fire and sword. In Hispaniola, in 1518, it conspired with Spanish war and bloodhounds and famine to exterminate the whole hapless race of Indians, which, a very few years before, had been computed at a million of people. Not long afterwards, in Mexico, it rapidly annihilated three millions and a half of people, leaving the country totally depopulated. In 1563 it destroyed whole races of men in the Brazils. In 1590 it spread itself along the coast of Peru, and swept away all the Indians and mulattoes in the cities of Potosi and De la Paz, and the adjacent countries, insomuch that the mines were deserted for a considerable time, and the country left desolate. Mr. Prescott, in his *History of the Conquest of Mexico*, describes its progress as sweeping over the land like fire over the prairies, smiting down prince and peasant, leaving its path strewn with the dead bodies of the natives, who (in the language of a contemporary) “perished in heaps, like cattle stricken with the murrain.” Even in our own day dire evidences have been given by Catlin of its destructive agency amongst the American Indians. “Thirty millions of white men,” he observes, “are now struggling and scuffling for the goods and luxuries of life over the bones and ashes of twelve millions of red men, six millions of whom have fallen victims to the Smallpox, the remainder to the sword, the bayonet, or whisky.” Washington Irving mentions entire tribes as having

been wholly, or in great measure, exterminated by it. The tribe of Mandans was completely swept away; the Assiniboins, the Blackfeet, the Crows, and the Ricarees almost so. It is stated, that the translation of the Bible having been made for the Six Nations, by the time it was finished there was not one left to read it, the whole nation having perished of Smallpox.

As a proof how indifferent this dreadful pestilence is to climate, it is stated to have put to flight tribes of Esquimaux on the coast of Labrador; and its progress in Kamschatka was marked by "ravages not less dreadful than those of the plague." It has visited Siberia and Iceland with epidemics of terrible severity, in one of which, in 1707, it carried off eighteen thousand out of a population of fifty thousand. In Greenland, in 1734, it spread so fatally that nearly two-thirds of the inhabitants were destroyed.

Many other instances of the fearful destructiveness of this malady might be given. Thus, in Thibet, on one occasion of its visitation, the destruction was so great that the capital was deserted for three entire years; nor was it repopled until it was supposed to have been purged of the pestilence. In Russia it is said to have cut off two millions of people in a single year; and at Constantinople it has in many inroads proved fatal to one-half of those affected.

Nor did civilisation and refinement afford any exemption from its ravages. Dr. Lettsom has calculated that 210,000 persons fell victims to it annually in Europe. Mr. Simon goes so far as to declare that its annual ravages have been estimated at half a million of lives. It occurred, indeed, with such constancy, that, whilst a large proportion of the population was already

defended, by having undergone the disease, yet for every five persons so protected one at least must have previously perished. M. De la Condamine reckons that in France a tenth of the deaths were by Smallpox. Rosens' calculation for Sweden was similar. In England, according to Dr. Jurin, one-fourteenth of the average of deaths was from Smallpox, even when it was not raging epidemically. De la Condamine estimates that this disease maimed, blinded, or disfigured, nearly a fourth part of mankind; and Sir Gilbert Blane, quoting a Report of the Hospital for the Indigent Blind, states that two-thirds of those applying there for relief had lost their sight by Smallpox. Bernouilli believed that not less than fifteen millions of human beings were deprived of life by it every twenty-five years.

Lastly, in an explanatory paper accompanying official answers made by the Government of Denmark to a variety of questions submitted by Her Britannic Majesty's Government in relation to Smallpox, it is calculated that out of a population of one hundred and sixty millions, forty-five millions of lives fell victims to this scourge during one century in Europe alone.

If, turning our attention from the aggregate effects of this fearful disease, we contemplate its ravages in particular families, we find that no rank could escape its destructive power. Mr. Simon has pointed out that a sad illustration of its impartial severity is to be found in the family of our own king William III. His father and mother fell victims to it, as did his devoted wife, as well as his uncle the Duke of Gloucester, and his cousins, the eldest son and youngest daughter of James II. The great prince himself suffered from it so severely that his constitution remained permanently shattered by it.

The Smallpox was, in truth, a perpetual terror to mankind, and thus it continued without a prospect of mitigation until the commencement of the last century.

Sydenham, indeed, who was the first physician that gave precision to the description of the disease, his account of its symptoms being minutely accurate, advised measures of treatment so judicious as to leave, even at the present day, little room for addition or improvement. His method of treatment was not, however, adhered to as it deserved. He was followed by Boerhaave of Leyden, who dwelt strongly on the contagiousness of the malady, which he attributed to a peculiar miasm thrown out from the patients affected with it. He thought that a specific might be discovered to overcome the matter of this contagion, and suggested for that purpose a combination of antimony and mercury.

At the beginning of the 18th century, Lady Mary Wortley Montague made known to our country the remarkable fact, that by the process of inoculation the disease to the person thus treated could be rendered comparatively mild, and almost disarmed of its danger. It is a curious and still unexplained fact, that the simple circumstance of the poison of the disease being conveyed through a puncture of the skin, instead of through an infected atmosphere, should so modify its severity.

Such, however, in the East, had long been known to be the fact. Inoculation appears to have been there practised for ages. The Chinese had performed it from the sixth century, and the Brahmins from a very remote antiquity. In Persia, Armenia, and Georgia, it was in use; and is even said to have been employed in Scotland and Wales. It was not, however, until the wife of our ambassador at Constantinople wrote her celebrated letter

from Adrianople, in 1717, that any interest was created for this operation. In that letter she writes, "The Smallpox, so fatal and so general amongst us, is here entirely harmless by the invention of *engrafting*, which is the term they give it. Every year thousands undergo the operation, and the French ambassador says pleasantly, that they take the Smallpox here by way of diversion, as they take the waters in other countries. There is no example of any one who has died of it, and you may believe I am well satisfied of the safety of this experiment, since I intend to try it on my dear little son. I am patriot enough to take pains to bring this useful invention into fashion in England." Thus this lady, by her example as well as by her literary power, gave her support to the practice, to which she had been the first to draw public attention. Four years afterwards, she had her daughter publicly inoculated in this country.

In 1722, after a preliminary experiment on six condemned criminals at Newgate, made in the presence of several physicians, surgeons, and others, and which resulted favourably, the critical course was taken of inoculating two children of Caroline princess of Wales, which gave a sanction to the practice.

Inoculation was not, however, thoroughly established, or properly appreciated, until the end of the century. Every sort of opposition was offered to it. Sermons were preached from the pulpit against it, and every kind of evil influence was attributed to it. It was said to be wicked and irreligious, to savour strongly of magic, to promote vice and immorality, and to be an inspiration of the devil. As a specimen of this sort of reasoning, we may refer to a sermon preached by the Rev. Edward Massey, on the dangerous and sinful practice of inocu-

lation, in 1722. That clergyman states that Job's distemper was the confluent Smallpox, and that he was inoculated by the devil, and expresses a hope that a time will come when those preparers of poisons and spreaders of infection will have a stigma fixed on them, and no longer be permitted to mingle with other professional men; which he says, indeed, is as presumptuous in them as it was in the devil to mingle with the sons of God.

Passing by such fanatic ravings as these, it must be admitted that those who opposed the practice on more rational grounds were not without very plausible argument against it. In one, and that a most important particular, the result was anything but satisfactory. Inoculation was not by any means an unmixed blessing. For though it was invaluable to him who underwent the operation, and, if successfully performed, armed him almost in proof of mail against any possible attack of the natural disease—at all events, from the mild form which the disease, when consequent on inoculation, assumed, protected him from the danger of death or disfigurement, or the long train of evils which so often followed the Smallpox—yet there can be no doubt the effect on the community at large was eminently pernicious, by keeping alive the natural disease and encouraging its spread.

Thus, while on the one hand we have abundant proof of the value of this operation in protecting the individual from the fact that, whereas of those who took the natural disease one in five or six died, of those who took the disease by inoculation the loss, according to the statement of Dr. Jurin, was only one in fifty—indeed, according to Dr. Gregory, the average number of deaths at the Inoculation Hospital was only three in a thou-

sand—yet its effect on society must on the whole have been disastrous; for Dr. Heberden, in his work on the increase and decrease of different diseases, declares, that out of every thousand deaths within the bills of mortality, the number attributed to Smallpox during the first thirty years of the eighteenth century, before inoculation could have had any practical effect on them, amounted to seventy-four per thousand, while during an equal number of years at the end of the century, they amounted to ninety-five per thousand, so that they would appear to have increased in a proportion of above five to four. Mr. Moore states, that at the beginning of the eighteenth century about one-fourteenth of the population died of Smallpox, whereas at the latter portion of the same century the number had increased to one-tenth. But he observes, “this immense consumption of human lives was not the sole evil produced by this distemper, for a considerable portion of the survivors were pitted and disfigured; some lost one of their eyes, a few became totally blind, and others had their constitutions impaired and predisposed to a variety of complaints, which were productive of future distress and sometimes of death. These additional calamities cannot be reduced to calculation; but as the mortality of the Smallpox was continually on the increase, these concomitant evils must have been so likewise.”

A pathetic commentary this on the value and efficacy of inoculation, on which Mr. Simon remarks with an eloquence singularly sad,—“Against the substantial justice of this painful criticism, so far as I am aware, no objection can be raised. Medicine baffled and helpless! for after times, for millions of our race, the continued

raging of this pitiless plague ! A drearier picture could scarcely have saddened mankind."

Such was the forlorn and hopeless picture of the state of the world as respects this fell pestilence at the end of the eighteenth century, and such it seemed likely to remain, when the observation, sagacity, and persevering wisdom of one man suddenly threw a gleam of succour and consolation over the dreary scene. Happy the name and blessed the memory which shall ever be associated in the remembrance of a grateful world with the discovery of Vaccination ! a discovery which has conferred an inestimable blessing on mankind, and shed a glory on the profession of medicine of which it cannot be deprived.

It had been known from an early period among the great dairy-farms in Gloucestershire, that cows were occasionally affected with a peculiar pustular disease, which could be transferred to those who milked them ; and a belief prevailed in the dairies, that the milkers thus affected might be exposed in any way to the contagion of Smallpox and yet escape that disease.

Dr. Jenner's attention had been drawn to this singular fact, by noticing that attempts to inoculate those who had had this vaccine disease were not usually attended with success. In his original Essay, he cites numerous instances of individuals who, having contracted an infection from cows or horses, had resisted for twenty, thirty, and even fifty years, all attempts to infect them by inoculation, and who, if exposed to the effluvia of Smallpox, had failed to take the disease.

He met with cases, indeed, in which those who had suffered from this so-called Cowpox, continued susceptible to the Smallpox ; but on investigating the cause

of these exceptional cases, he found that the cow was liable to other spontaneous eruptions upon her teats, which were capable of producing sores when applied to the hands of the milkers, all which sores were indiscriminately called Cowpox. By diligent observation he learned how to distinguish these different eruptions from the more important one which produced in the human frame the protecting disorder: the latter he named the true, the other the spurious Cowpox.

This impediment to his inquiry was not long removed before a fresh difficulty presented itself. He found that even when the *true* Cowpox broke out among the cattle, persons infected from it were in some instances capable of taking the Smallpox:—that while one milker affected with sores from a cow to-day might remain permanently defended from Smallpox, another, infected from the same animal a day or two later, might have a sore or sores on the hand, and suffer considerable constitutional disturbance, and yet remain as susceptible of Smallpox as before.

This perplexing circumstance would have discouraged the zeal of most men; but Dr. Jenner, reflecting that the operations of nature are generally uniform, and that it was not probable that the human constitution having undergone the Cowpox should in some instances be perfectly shielded from the Smallpox, and in others remain unprotected, without some sufficient cause, resumed his researches with unabated earnestness. He was rewarded for his perseverance: he soon learned that the pustule of Cowpox, like that of Smallpox, passed through certain peculiar changes, and that lymph taken from it late in its progress, when it had undergone degeneration, might produce a severer local ulceration than that of an earlier date, yet, having lost its specific pro-

perties, was worthless as a protective against Smallpox. It is now known that on the basis of this important truth some of the most valuable principles connected with the practice of vaccination are founded.

Dr. Jenner's labours had thus proved,—first, that the accidental disease from horses and cows called the Cowpox was protective against the influence of Smallpox; secondly, that there were certain causes which interfered with the uniform protective efficacy of the vaccine disease. Subject to the last-named qualification, he satisfied himself by experiment that protection could be obtained artificially, whenever the cattle were affected by the vaccine disease, by imitating the process of inoculation in a transfer of this vaccine matter from the body of the cow to the human system.

If Dr. Jenner's researches had secured only these results they would have been eminently interesting and important. He had cleared away from the subject the many causes of obscurity which surrounded it, and out of the crude impressions and experience of peasants had, by the force of his reasoning and by careful experiment, elaborated most valuable truths. He had added to the science of his profession, and had proved himself a man of original power; yet, if he had stopped here, he could hardly have claimed the merit of an exclusive discovery. For, the idea of inoculating with the virus of the vaccine disease did not originate with our countryman. Reports as to the protective efficiency of Cowpox had been diffused abroad. Notice of it had appeared in a Swedish newspaper in 1769; and in Holstein, the virus of Cowpox had on different occasions been conveyed to the human subject. A village schoolmaster near Kiel had actually inoculated three children from the cow in 1791.

“But,” says Mr. Simon, “this was not the limit of

Jenner's achievement. Happily for mankind, his thoughts had from the first stretched further forward in the subject ; and it was his transcendant merit to show how that apparently local privilege of the Gloucestershire cowherds might be diffused for the blessing of nations."

After having satisfied himself that the vaccine disease could be conveyed from the cow to man, the great and original idea occurred to him that it might be transmitted from one human being to another, and that by this means it would be possible to keep up a perpetual supply of renewed lymph, always multiplying itself, and for ever ready to keep in check the spread of the Smallpox, and thus render mankind independent of the uncertain supply which the casual disease in the cow afforded, and which his own experience had told him it required so much judgment to select. In his first Essay, having completed his experiments, he announced this wonderful fact as the result. In that "masterpiece of medical induction," as Simon aptly terms it, he tells us that he had already conveyed this lymph five times in succession from one human subject to another, and that the last of the cases had been proved, by Smallpox inoculation, to be as well protected as the first.

There is little doubt that this great truth had passed before his imagination when quite a youth—thirty years before he gave his discovery to the world, when he was only a village-doctor's apprentice. A young peasant girl had in his presence stated that in consequence of having suffered from Cowpox she was secure against an attack of Smallpox. The memory of this simple statement never deserted him, and when, in 1770, he became the pupil of John Hunter, he mentioned the circumstance to his teacher, with his hopes in respect of it. That emi-

ment person was at the time so fully engaged in a variety of original investigations that he had not time to give the subject his serious attention, and perhaps was not fully impressed with its importance: he, however, advised Jenner to investigate the subject, his remark being,—“Don’t think, but try; be patient, be accurate:” a common remark of his to inquiring students, and one which might have stimulated a less earnest enthusiasm than that which so signally impelled the mind of Jenner in this most difficult inquiry. Indeed the example as well as the precept of his great teacher gave an impulse to the whole of Jenner’s noble career. When he was settled in practice he often mentioned his views to his professional brethren, and besought them to apply themselves to the inquiry; but, knowing as they did the contradictory nature of the evidence which attached to the subject, they smiled at his eager interest in it, and assured him that any attempts to unravel its difficulties could only lead to uncertainty and disappointment.

It is however certain, that as early as 1780 he communicated to a friend, with deep and anxious emotion, “his hope of being able to propagate the matter of Cowpox from one human being to another, till he had disseminated the practice all over the globe, to the total extinction of Smallpox.”

He anxiously sought an opportunity of putting his theory to the test; and in the sixteenth experiment, reported in his celebrated work, entitled, *An Inquiry into the Causes and Effects of the Variolæ Vaccinæ*, he, on the 14th of May, 1796, took from the hand of Sarah Nelmes, who had been accidentally infected from the cow, matter which was inserted into the

arm of a boy named Phipps by two superficial incisions, each about half an inch long. The appearance of the incisions in their progress to a state of maturity were much the same as when produced from the matter of Smallpox. Yet, as the indisposition attending it was barely perceptible, he could scarcely persuade himself that the patient was secure from the Smallpox. This indeed was the turning-point of the inquiry, and the anxious part of the experiment. He inoculated this boy on the 1st of July following with matter immediately taken from a smallpox pustule, and no disease followed. After several months he again inoculated him, and no sensible effect was produced on the constitution. This interesting experiment inspired him with confidence, and as soon as he could procure fresh virus from the cow, which was not till the spring of 1798, he made arrangements for a series of inoculations of children from one to the other. These children were afterwards exposed to the infection of Smallpox, both by inoculation and exposure to the effluvia of the disease, and they all resisted it.

This case of the boy Phipps may be considered the birth of Jennerian Vaccination.

A singular circumstance was noticed by Dr. Jenner, as apparently coincident with the origin of the disease in the cow. He observed that the disease was only to be met with in certain farms, on which men were employed who combined the charge of horses with their duties in the dairy. He found that in these farms the horses suffered from sore heels, a disease which was named by the farriers "the grease:" hence he was led to believe that matter was conveyed from these diseased horses by the milkers to the teat of the cow, and that the protective

properties of the vaccine disease depended on the peculiar modification which it underwent in passing through the system of the cow.

Abundant evidence has since proved that the horse as well as the cow suffers from a vesicular disease, and that lymph taken from the horse when thus affected produces in man a pustule similar to the vaccine. It is equally protective against the Smallpox, and occurs spontaneously in both animals. It was surnamed "the grease" by the farriers, because it was commonly seen on the thin skin of the horses' heels, though it is now known that the vesicles appear on other parts of the animal's body. Indeed, according to Dr. Baron, the horse, as well as the cow, has in different ages suffered from both the mild and malignant Smallpox. Such being the case, there is no doubt that the disease was actually conveyed in the way that Dr. Jenner surmised, in the cases which came under his notice. One observer, Mr. Tanner, succeeded in communicating the disease to the cow by inserting some liquid matter taken from the heel of the horse. This produced on the teat of the cow a complete vaccine vesicle. "From handling the cow's teat," he observes, "I became infected myself, and had two pustules on my hand, which brought on inflammation, and made me unwell for several days. The matter from the cow and my own hand proved efficacious in infecting both human subjects and cattle." In fact Dr. Jenner often used equine matter himself in vaccination with complete success, and on one occasion transmitted it to Edinburgh, where it produced the genuine vesicle. At any rate, his misapprehension on this point is not to be wondered at in the infancy of so complicated an inquiry.

It now appears certain that there are at least four animals, namely, the horse, the cow, the sheep, and the goat (and to these the pig and the ape may probably be added), which are affected with a disorder which may be conveyed to man by inoculation, and thus becomes capable of defending him from a malignant form of the same disease, namely, the Smallpox of the human subject.

Dr. Jenner inoculated his eldest son in 1789 with swinepox matter, who was afterwards inoculated with smallpox without any result. Indeed, it has been proved by direct experiment that many animals are capable of receiving the vaccine disease by inoculation, and that matter taken from vesicles so resulting produces in man the genuine Cowpox.

Having thus presented a short outline of the reasoning and experiments which led Dr. Jenner to the grand result of his labours, namely, that Cowpox is thoroughly protective against the infection of Smallpox, and that its protective efficiency can be infinitely multiplied by the process of Vaccination, it may be interesting to notice how this great discovery was first received by the medical profession and by the general public.

By the better educated members of the medical profession it was at once accepted as true. Mr. Cline, the eminent surgeon of St. Thomas's Hospital, was the first to test it by actual experiment; and, early in 1799, Dr. Woodville performed a number of vaccinations in London. Dr. Jenner himself, writing in 1801, says, "upwards of 6000 persons have now been inoculated with the virus of Cowpox, and the far greater part of them have since been inoculated with that of Small-

pox, and exposed to its infection in every rational way that can be devised, without effect." Dr. Woodville stated in his public evidence before a Committee of the House of Commons in 1802, that 7500 persons were vaccinated at the Smallpox Hospital in the two years 1799 and 1801, half of whom were subsequently inoculated with smallpox matter, without taking the latter disease. Dr. Jenner, in his evidence given before a Committee of the House of Commons in March 1802, concludes,—“The distrust and scepticism which naturally arose in the minds of medical men on my first announcing so unexpected a discovery has now nearly disappeared. Many hundreds of them, from actual experience, have given their attestations that the inoculated Cowpox gives a perfect security against the Smallpox, and I shall probably be within compass if I say that thousands are ready to follow their example, for the scope that this inoculation has now taken is immense. One hundred thousand persons, upon the smallest computation, have been inoculated in these realms. The numbers who have partaken of its benefits throughout Europe and other parts of the globe are incalculable; and it now becomes too manifest to admit of controversy that the annihilation of the Smallpox, the most dreadful scourge of the human species, must be the final result of this practice.”

It is melancholy to be obliged to confess, in this year 1860, that the epidemic spread and great mortality of Smallpox force upon us the sad conviction that this prophetic assertion of the great discoverer has not been fulfilled; and we reluctantly ask ourselves whether its comparative failure is to be attributed to neglect of the rules which he propounded with so much care and

anxiety, or whether even the most perfect practice of Vaccination will ever completely succeed in realising this his sanguine expectation. But to proceed with our narrative.

Early in 1802 Dr. Jenner's discovery was formally brought before Parliament, with the view of its granting him some reward, as it was thought that the "magnitude of his discovery and the very disinterested manner in which he was sacrificing his time and his property in diffusing its blessings were fit subjects for the consideration of the British Parliament." It was decided, that inasmuch as an application to Parliament had ulterior reference to a grant of money, the best form of appeal would be by petition; and such a petition having been presented, Mr. Addington, the prime minister, informed the House that he had taken the King's pleasure on it, and that his Majesty recommended it strongly to the consideration of Parliament. This petition was referred to a committee, of which Admiral Berkeley was appointed Chairman. After examining witnesses of the highest character and most extensive experience in the profession they reported, "that the discovery of Vaccine inoculation is of the most general utility, inasmuch as it introduces a milder disorder in the place of the inoculated Smallpox, and which is not capable of being communicated by contagion; that it does not excite other humours or disorders in the constitution; that it has not been known in any one instance, to prove fatal; that the inoculation may be safely performed at all times of life (which is known not to be the case with regard to Smallpox), in the earliest infancy, as well as during pregnancy and in old age; and that it tends to eradicate, and, if its use becomes universal, must absolutely extinguish, one of the most

destructive disorders by which the human race has been visited." In fact, they corroborated in every particular all that Jenner claimed for his discovery. Admiral Berkeley, in introducing that Report, said,—“In the investigation of a matter so important to mankind in general, it was not thought right by the Committee to confine their examination to the petitioner's evidence alone, but to sift out any case which could make against it: this conduct, which certainly may appear to bear hard on the petitioner, has proved a matter of fresh triumph to him.” The sanction thus given to the views of Jenner had its effect. At the close of 1802, “steps were taken, with unprecedented strength of public support, to found by voluntary contributions a Society for the extermination of Smallpox, and on the 3rd of January, 1803, the great discoverer took his seat for the first time as President of the Royal Jennerian Society. This society took an active part in diffusing the blessings of Vaccination. Thirteen stations were opened in different parts of the metropolis. In eighteen months they were enabled to announce that 12,228 vaccinations had taken place, and during the same space of time 19,352 charges of vaccine virus were supplied from the central house to most parts of the British empire and to foreign countries.

But it would have been too much to expect that a discovery of such importance should meet with no opposition; and some allowance must indeed be made for those who declined to accept this innovation on their previous convictions and practice, founded as it was only on the traditions of peasants and the experience of one thoughtful mind, and appealing to no general experience of its benefits.

As, eighty years before, Inoculation had been de-

nounced on religious grounds as impious, so now, against Vaccination, Leviticus was quoted, with dark insinuations "against contaminating the form of the Creator with the brute creation." Smallpox being, as it was alleged, "a merciful provision on the part of Providence to lessen the burden of a poor man's family, was it not impious and profane to wrest out of the hands of the Almighty these divine dispensations?" "What could ensue, on so daring a measure of attempted prevention, but some unimagined punishment?" Ehrmann of Frankfort attempted to prove, from quotations of the prophetic parts of Scripture, and the writings of the Fathers of the Church, that the vaccine was nothing less than Antichrist.

Nor was the opposition of a portion of the medical profession less rabid and determined. It is true, as we have already observed, that the conclusions of Dr. Jenner were accepted immediately by persons of judgment in the profession. In the face of all the facts and experiments he had produced, it was difficult for any person of sound judgment and candid mind to doubt that a great and most beneficial discovery had been made for the advantage of mankind. Yet, however highly the merit of Dr. Jenner and the value of his discovery were appreciated by the more educated members of his own profession, none the less fervent and vituperative was the opposition of those who, from narrow-minded views or interested motives, resisted the introduction of Vaccination. "The nation," it was said, "was dying of Vaccination." To one author's fancy Vaccination was a mighty and horrible monster, with the horns of a bull, the hind hoofs of a horse, the jaws of the kraken, the teeth and claws of a tiger, the tail of a cow, &c. Terrible portents were described. A child at Peckham

was said to have had its former natural disposition absolutely changed to the brutal, so that it ran upon all-fours like a beast, bellowing like a cow, and butting with its head like a bull! Such, and numerous other horrible images of deformity or transformation were imagined, and described as having been seen. It is difficult now to imagine the nonsense and absurdity which was then put forward. Lord Jeffrey, in an able and amusing Essay published in the *Edinburgh Review*, in 1807, has presented us with a curious picture of the anger with which the subject of Vaccination was argued, and the literary acrimony and coarseness which possessed the professional disputants, while discussing the merits of a discovery now recognised as a vast and inestimable blessing. After narrating the reception of the great discovery, Lord Jeffrey continues:—"In the end of the year 1804, Dr. Moseley published his *Treatise on the Cowpox*, in which the ravings of Bedlam seemed to be blended with the tropes of Billingsgate. Dr. Rowley followed on the same side, and in the same temper, with 500 cases of the beastly new diseases produced from Cowpox; and attracted customers by two coloured engravings at the head of his work, of the Cowpoxed or Oxfaced boy, &c. The battle now became general. The Rev. Rowland Hill thundered in defence of Vaccination. Dr. Squirrel leaped from his cage on the whole herd of Vaccinators. Mr. Birch insisted on stating his serious reasons for objecting to Cowpox. Drs. Lettsom and Thornton chanted pæans in its praise. Mr. Lipscomb strutted forward with a ponderous wordy dissertation on its failures and mischiefs; and Messrs. Ring, Merriman, and Blair, answered everybody, and exasperated all their opponents by their intemperance and personality.

Charges of murder and falsehood were interchanged among the disputants without the smallest ceremony: the medical journals foamed with the violence of their contention; it raged in hospitals and sick chambers, and polluted with its malignity the sanctity of the pulpit and the harmony of convivial philanthropy." "In the whole course of our censorial labours," continues Lord Jeffrey, "we have never had occasion to contemplate a scene so disgusting as is presented by the greater part of this controversy; nor do we believe that the virulence of political animosity, or personal rivalry or revenge, ever gave rise among the lowest or most prostituted scribblers to so much coarseness, illiberality, violence, and absurdity as is here exhibited by gentlemen of sense and education, discussing a point of professional science with a view to the good of mankind. At one time, indeed, we were so overpowered and confounded by the rude clamour and vehement contradictions of the combatants, that we were tempted to abandon the task we had undertaken, and leave it to some more athletic critic to collect the few facts and the little reasoning which could be discovered in this tempest of the medical world."

This is a strong, but doubtless accurate description, of the party-spirit, bigotry, and selfishness which influenced many members of an honourable profession to throw doubt on the simple and truthful statements of one of the greatest benefactors of our race, and affords a sufficient proof of the difficulties which beset the popular mind when estimating the value of a new discovery. To the masses, these fierce charges and countercharges were the arguments of men holding learned diplomas, and produced their evil results by creating doubts and dis-

affection. These absurd and rancorous disputes created the alarm and hesitation which might be expected, and the public demanded that they should be explained. The result was, that two most critical inquiries were instituted. First in 1805, by the Medical Council of the Royal Jennerian Institution, comprising among its members surgeons and physicians of the largest practice and highest character in London, who state, “that in their opinion, founded on their own individual experience and the information which they have been able to collect from others, mankind have already derived great and incalculable benefit from the discovery of Vaccination; and it is their full belief, that the sanguine expectations of advantage and security, which have been formed from the inoculation of the Cowpox, will be ultimately and completely fulfilled.” A second inquiry was instituted in 1806, on the motion of the present Lord Lansdowne, then Chancellor of the Exchequer, “that an humble address be presented to his Majesty, that he will be graciously pleased to direct his Royal College of Physicians to inquire into the state of the Vaccine inoculation in the United Kingdom, and to report their opinion as to the progress which it has made, and the causes which have retarded its general adoption.”

This was by far the most important investigation which the discovery of Jenner had yet undergone, and it may be well to quote the concluding passages of the Report to which it led:—“The College of Physicians feel it their duty strongly to recommend the practice of Vaccination. They have been led to this conclusion by no preconceived opinion, but by the most unbiassed judgment, formed from an irresistible weight of evidence

which has been laid before them. For, when the number, the respectability, the disinterestedness, and the extensive experience of its advocates is compared with the feeble and imperfect testimonies of its few opposers; and when it is considered that many who were once adverse to Vaccination have been convinced by further trials, and are now to be ranked amongst its warmest supporters, the truth seems to be established as firmly as the nature of such a question admits; so that the College of Physicians conceive that the public may reasonably look forward with some degree of hope to the time when all opposition shall cease, and the general concurrence of mankind shall at length be able to put an end to the ravages at least, if not to the existence, of the Smallpox."

In 1807 Parliament voted to Dr. Jenner a sum, amounting in all to 30,000*l.*, as a reward for his discovery, and the generous devotion of his time and talents to the public welfare. In 1808 the National Vaccine Establishment was formed, for the purposes of public vaccination in London, and for the supply of lymph, and an annual grant of 2000*l.* per annum was voted by Parliament for its support.

A short account of the adoption of Vaccination throughout the various parts of the world will probably not be devoid of interest.

In the year 1799, a knowledge of Dr. Jenner's discovery was conveyed, by means of his first Essay, to Geneva, Hanover, and Vienna. Drs. Odier and Peschier of Geneva collected all the evidence they could obtain respecting Vaccination, and published their information in the *Bibliothèque Britannique*. Dr. De Carro of Vienna took up the cause in that city, and was singularly active

in disseminating the benefits of the new practice. He was instrumental in introducing it over the greater part of Europe, and finally through Turkey to our own possessions in Asia. In the same year a copy of Dr. Jenner's work was conveyed to the shores of North America, and Dr. Lettsom transmitted a copy of it to Dr. Waterhouse of Cambridge, Massachusetts, who was very active in diffusing a knowledge of Vaccination, and was the first to test its practice by vaccinating seven of his own children, who were afterwards inoculated without effect. President Jefferson, in 1801, assisted by his sons-in-law, vaccinated, in their own families and those of their neighbours, nearly two hundred persons. When Dr. Jenner's work was first published, our country was at war with France, which somewhat delayed its use in that country. In the year 1800, a joint committee was named by the National Institute and the Ecole de Médecine to obtain information on the subject; and about the same time Dr. Colladon of Geneva returned from England to the Continent, and carried with him virus to Paris. With this virus trials were made at the Salpêtrière, under the superintendence of M. Pinel. Unluckily they did not prove successful. M. Laroche-foucault Liancourt, however, commenced a subscription for establishing a Vaccine Institution in Paris; and among the first of the list of names for this honourable purpose was found that of the Minister of the Interior, Lucien Bonaparte. At Rheims, Rouen, Amiens, Brussels, Marseilles, Bordeaux, associations were formed to promote Vaccination. In the month of January 1800, the Count de la Roque translated the *Inquiry* into French; and three editions were sold in less than seven months. From Paris vaccination spread into Spain, in the latter

part of the year 1800. The Spanish Government was very active in promoting it, and in October, 1801, the new practice had become general throughout the country. The universal interest and curiosity attached to this new discovery added vastly to the labours of Dr. Jenner. The object to which he had applied his mind was one of universal interest, and belonged to all mankind, and it was to him principally that foreigners, as well as his own countrymen, applied for advice and instruction, as well as for supplies of lymph. Early in 1801 Dr. Walker and Dr. Marshall were sent on a mission to Malta and Gibraltar and all the countries bordering on the Mediterranean, to introduce Vaccination. Dr. Walker accompanied Sir Ralph Abercrombie's expedition to Egypt, and vaccinated all the seamen and soldiers connected with it; while Dr. Marshall carried its benefits from Gibraltar to Minorca, Malta, Sicily, and Naples. In 1800 the practice was introduced into the army and navy—a measure highly important with reference to the efficiency of these departments, the spread of Small-pox having on many occasions crippled those services severely. Dr. Trotter, then Physician to the Fleet, aided its diffusion in the navy with the greatest zeal, and in 1800 declared “that the introduction of the Jennerian inoculation will be recorded deservedly as one of the greatest blessings to the navy of Great Britain.” Dr. Jenner was at this time interesting himself in its extension to our Eastern possessions, but Dr. De Carro of Vienna, who had already conveyed it by his unwearied labours to a great part of Germany and Poland, and also to Venice, Lombardy, and other parts of Italy, was enabled, through the parents of Lady Elgin, the wife of the British Ambassador, to convey it to Constantinople,

where the infant son of that nobleman was the first to receive it ; and in 1803, the prejudices of the Mussulman population being overcome, between five and six thousand people were vaccinated. From Constantinople it was conveyed, by Lord Elgin's aid, to Bombay, by the way of Bagdad and Bussorah. The virus which served to protect the Eastern part of the world, was derived from the cows of Lombardy. It had been sent from Milan by Dr. Sacco to Vienna, and was forwarded thence by Dr. De Carro to Constantinople.

The Indian Medical Board, anxious to diffuse the benefit throughout India, forwarded virus to Bengal, Madras, Ceylon, &c. It soon took effect at Hyderabad and Trincomalee, and was spread with great rapidity from place to place. Its use in Ceylon proves beyond doubt, that, when the practice is thoroughly carried out, as it was by the active zeal of Mr. Christie, the Medical Superintendent General, the contagion of Smallpox may be certainly and completely controlled. Smallpox had ravaged that country with great severity. Dr. Jenner was in the habit of pointing to Ceylon and Sweden when he wished to prove what his discovery might accomplish.

In 1802 the practice was carried by Lord Elgin to Athens, Argos, Corinth, and other cities of Greece. In the summer of 1801 Dr. Jenner sent some of the matter to Copenhagen, and from Denmark it was disseminated into Sweden. In the course of this year it was conveyed to our West Indian colonies. The Swiss Republic gave an authoritative sanction to it in the same year ; and in October, 1801, vaccine matter was sent from Breslau to Moscow, and the Emperor Alexander appointed a mission to carry the antidote to the remote parts of the Russian empire, with the inten-

tion of its ultimately reaching China and the whole of the northern parts of Asia.

In 1803 an expedition was fitted out by the King of Spain, for the purpose of conveying it to all the possessions of the Crown of Spain beyond the seas, as well as to those of several other nations. This expedition returned to Madrid after an absence of three years, Dr. Francis Xavier Balmis, the conductor of it, having circumnavigated the globe, and more than realized the most sanguine expectations that were entertained of the results of his mission. The aboriginal American, the followers of Brahma and Confucius, the fanatic Mohammedan and the enlightened European, alike accepted this bountiful discovery. In little more than six years after its promulgation it was known in every clime; and in the words of Dr. Baron, to whom I am indebted for most of these particulars, "Proceeding eastward and westward from our own island, it traversed the circumference of the globe, and had the practice been pushed in all countries with the same zeal and perseverance as it has been in some, Smallpox by this time might probably have been known only in name, and by the melancholy records of its former ravages throughout the world."

And now arises the interesting and all-important question,—What is this Vaccinal disease?

Dr. Jenner, considering the Vaccinal disease as perfectly analogous to the human Smallpox, or at any rate a modification of the same distemper, named it, when it affected the cow, the "*Variolæ Vaccinæ*;" and both observation and experiment have attested the propriety of that appellation.

Yet we may well admire the genius and sagacity of

the man who surmised the singular fact of the identity of the two discases. There appears to be so little analogy between the symptoms of Cowpox and those of Smallpox, as they present themselves in man—the latter being at once eminently fatal and pestilential, whilst the affection derived from the cow is mild and nowise pestilential—that, even to this hour, the influence of Vaccination is commonly thought to arise from its being an antidote to the Smallpox, rather than the self-same disease modified by its transit through the body of the cow.

Now, it is impossible to estimate the true value of Vaccination, or the nature of the security which it affords, unless our convictions as to the identity of the two diseases are clearly established. I shall, therefore, place before the reader the proofs upon which this truth is founded.

There is abundant evidence to prove that cattle as well as other animals have, in different countries and ages, been affected by a disease of a malignant character, to which the term Variola, or Smallpox, has unhesitatingly been given by the different writers who have witnessed and described it. It raged amongst the cattle in an epizootic form, and was nearly as fatal to animal life as the Smallpox was to the human race. The same name has been given to it by various Italian observers, by whom its symptoms have been described.

This cattle disease ravaged this country in 1745, 1770, and again in 1780. Dr. Layard, who published his second paper in the *Transactions of the Royal Society* during this latter year, declared that it bore all the characteristic symptoms, and underwent the crisis and events of the Smallpox, and mentions the

interesting and remarkable fact that inoculation from cow to cow was practised to mitigate its severity.

So severe were the ravages of this distemper in the year 1770, that on the opening of Parliament in that year special reference was made to it in the King's Speech, which called down the bitter animadversion of Junius, who, in a letter of the 14th Feb. 1770, thus addresses the Duke of Grafton:—"While the whole kingdom was agitated with anxious expectation on one great point, you meanly evaded the question, and, instead of the explicit firmness and decision of a king, gave us nothing but the misery of a ruined grazier and the whining piety of a Methodist."

This disease among cattle has been found, like the Smallpox in man, in every part of the world. It has been seen in various parts of England, on the mountains of South America, in Asia, on the ranges of the Himalayan mountains, and amongst both cows and sheep in Persia. It has been discovered in the plains of Lombardy, and the low lands of Holland and Holstein; and so late as 1825, an affection of a precisely similar character was witnessed in a dairy in Gloucestershire. The veterinary surgeon who saw it described it as an aggravated case of Cowpox, "the whole skin, from the base of the horn to the end of the tail, and to the hoofs, being covered with the disease." The cows in Bengal have long suffered from this disease, and the natives employ the same words in speaking of it which they apply to the Variola in the human race. Mr. Macpherson, who witnessed the affection among cows at Moidapore in 1832, describes its symptoms in language so similar to that employed by Fracastorius and other Italian writers, that there can be no doubt of the

identity of the affection. The fact of its having been witnessed in regions so widely separated is a proof that it does not depend on any special peculiarity of climate or country, either for its existence or extension; and that, like the human Smallpox, it is equally capable of being propagated in every variety of temperature.

It remained, however, for an English surgeon to verify to the fullest extent the accurate surmise of Jenner as to the identity of the diseases, and to prove that these observations of writers in various parts of the world were founded in fact. To the indefatigable labours and untiring zeal of Mr. Ceely, of Aylesbury, we are indebted for this important affirmation of the conjectures of his predecessors. It is hardly too much to say, that the researches of this gentleman are second in merit and importance only to the experiments and thoughtful inductions of Jenner himself.

Many experiments had, it is true, been made by different individuals, in England and on the Continent, to inoculate the cow with human smallpox. It was said to have been done, in 1801, in the Veterinary College in Berlin; and M. Viborg, of Copenhagen, says that he conveyed the disease to dogs, apes, and swine. In 1807, Dr. Gassner of Guntzburg, after many unsuccessful trials, succeeded in inoculating a cow with human smallpox, and with the matter resulting from it inoculated four children, from whom he vaccinated seventeen others.

This important discovery of Dr. Gassner remained, however, unknown, until Dr. Keile of Kasan, in South Russia, repeated Gassner's experiments, and added infinitely to their value, by proving that persons inoculated with such matter might be exposed in any way to the

contagion of Smallpox, and were found to be completely protected from its effects. These experiments were published in 1839, at which time the experiments of Mr. Ceely were being carried on.

Dr. M'Michael, in a paper read before the College of Physicians in 1828, stated, that vaccine matter having failed in Egypt, it was found that, by inoculating the cow with smallpox from the human body, fine active virus had been produced, and that children had been vaccinated with matter thus obtained. In 1837, a series of inoculations was performed with virus from diseased cows by Mr. Macpherson, of Bengal, on which occasion an eruptive complaint of the true variolous nature was produced. The same phenomena have been observed at Gowalpara by Mr. Wood. In several of the cases mentioned by him, the symptoms were so severe as to excite apprehension that the disease would terminate fatally. He was so strongly impressed with this fact, that he thought it would be better to take human smallpox rather than cow smallpox for inoculation, when the latter assumes its dangerous and fatal form. It was thus proved that a severe variolous affection might be conveyed from animals to the human being, as well as the more mild and benignant disease.

To Mr. Ceely, however, we are indebted for the complete proof of the identity of the two diseases. "Biassed," as he observes, "by no theory, but impelled by an anxious desire to discover truth," his observations and experiments were made and conducted, like those of Jenner, amidst the fatigues and demands of an active rural practice. After infinite labour and frequent failure, he succeeded in conveying to the cow the smallpox matter from man. He produced vesicles in the cow,

from which several hundred patients were vaccinated. There was no attendant eruption in the patients thus vaccinated, or anything that could lead him to suspect that he had not conveyed the genuine Variolæ Vaccinæ.

He transmitted some of this matter to medical gentlemen, and in their hands it produced regular and proper vesicles, which in every respect corresponded with those so well delineated by Dr. Jenner in his first publication. This circumstance, observed by the same persons in several instances, forcibly arrested the attention of every one who saw the vesicles, though the source whence the lymph was derived was not known. "The correctness of the vesicles produced from the variolous matter thus obtained from the cow exhibits (say the Vaccination Committee of the Medical Association) *a marked contrast to that which we have seen produced by other virus now in use ; and we fear that the local as well as general disturbance occasioned by the latter, so far from being a source of protection, will be found to be the reverse.*" This comment on the virus in common use is significant, and will claim its due attention hereafter ; for though this Report was written in 1839, the matter now in use in this country is for the most part the same, and at any rate has not been renewed by the National Vaccine Institution.

The facts resulting from the foregoing statement prove, incontestably, that cattle are liable to a disease similar in every respect to the Smallpox in man ; that this disease has been called Variola by all the observers who have witnessed and described it ; that it assumes an epizootic form, and, like human Smallpox, has been met with in all climates ; that it has on various occasions, in this and in other countries, assumed a malignant

character, and has been very fatal to the animals affected with it; and that if matter taken from cows when labouring under the severer form of malady is used for vaccination, it will generate a dangerous disease in man.

The experiments of Keile and Ceely have satisfactorily proved that this disease is in reality the Smallpox of the cow. For, by conveying smallpox matter from man to the cow by inoculation, these observers have produced a vesicle similar to the natural one; while the virus thus artificially produced, carried by inoculation into the human system, produces all the ordinary phenomena of vaccination, and the lymph so generated in the human system may be transmitted from one human being to another, with results entirely similar to, and equally successful with, those produced by the common process of vaccination, having its origin in the spontaneous disease of the cow.

There can be no doubt that the distrust and opposition which awaited Jenner's discovery on its first promulgation would have lost most of its force if the results of these experiments had then been known. If Jenner could by their aid have asserted as fact that which with him was only speculative belief, namely, that the disease in man was identical with that of the lower animals, and that the value of his new process of inoculation really consisted in the introduction into the human system of smallpox matter, mysteriously modified by its transit through a lower organisation, this would have afforded the strongest *à priori* argument in support of his assertion and predictions, that the protection afforded by it would be equal to that given by Lady Wortley Montague's process of inoculation, or even to that resulting from an

attack of natural Smallpox, inasmuch as it was in fact the Smallpox itself.

That a disease of such severity should be thus modified is, indeed, a marvellous fact, and can in nowise be explained; and we ask in vain how it happens that the mere transmission of a poison of fearful virulence and infectiveness through a lower animal should thus disarm it of all its danger and power of contagion, while it still retains all its protective efficacy.

It is difficult for any one who has ever witnessed an attack of Smallpox in all its fearful severity, with the terrible disfigurement it produces, and has had experience of its contagious influence, to believe that the few innocent vesicles which result from vaccination, unattended by any eruption, and destitute of any infective element, can be the same disease deprived of all its graver symptoms and dangers: yet such, as established by demonstrative proof, is the undoubted fact.

The importance of these observations and experiments is not, however, confined to their merit as contributions to the pathology of the Vaccine disease, and as additional proofs of its prophylactic virtues, or that they are further illustrations of the prescience of Jenner, though in each of these respects they are of the highest value. Their chief interest consists in establishing the fact that the artificial disease, which is thus generated in the cow, is as protective when used for vaccination as the matter which arises from the natural disease in the animal; and that, whilst the latter disease is uncertain and irregular in its visitation, and difficult to distinguish from the other eruptive ailments which affect the cow, this, if sufficient care be used, and the suggestions of Mr. Ceely are attended to, can be at any time extemporised; and

thus fresh lymph, which will be protective against Smallpox, may always be obtained.

Mr. Ceely, in a communication with which he has favoured me, informs me that he has kept lymph thus procured, in private and public circulation, for more than three years; and Mr. Badcock of Brighton, who performed similar experiments twelve months afterwards, without knowing that they had been previously performed, has obtained lymph from the inoculation of cows nearly thirty times, and has supplied matter resulting from it to practitioners at home and abroad.

I reserve for another part of this paper the consideration of the arguments of the English and foreign observers, who insist that a recurrence to the cow is a matter of primary necessity, as a means of securing the complete protective efficiency of Vaccination. For the present I content myself with asserting that these experiments have proved, beyond dispute, that fresh inoculations of the cow with human smallpox may at any time be initiated, and that by this means at stated intervals, or whenever Smallpox may assume an epidemic, or unusually severe form, as at present, fresh and renewed virus may be furnished for the public vaccination in this country.

Vaccination having been generally adopted, we have next to inquire what reduction it has effected in the mortality of Smallpox?

The labours of Mr. Simon, fortunately, enable us to answer this question with tolerable certainty. As regards London, he states that the mortality from Smallpox during the eighteenth century ranged from 3000 to 5000 per million of living population per annum;

whilst during the ten years from 1846 to '55 it was under 340.

Dr. Lettsom, in his evidence before the Parliamentary Committee of 1802, estimated the Smallpox mortality of England at about 3000 per million of living souls. Dr. Blane's evidence was nearly similar. Whereas it can be shown, that for the years 1841-53 the average loss of life by this disease was only 304; in 1854, only 149; and in 1855, only 52 per million of living population.

Dr. Greenhow, in comparing the death-rates of London in 1858, with those at the end of the seventeenth and middle of the eighteenth century, tells us, that for every 100,000 people there died—

1681-90, from all causes,	4210	Smallpox,	313·9
1746-55,	„ 3550	„	304·4
1846-55,	„ 2490	„	33·8

The Committee of the Epidemiological Society give tables, which go to prove that, during the half-century preceding Vaccination, out of every 1000 deaths from all causes, an average of 100 deaths arose from Smallpox; whilst for the half-century succeeding this discovery, the deaths from Smallpox were—

For the ten years ending	1810 . . .	64
„ „	1820 . . .	42
„ „	1830 . . .	32
„ „	1840 . . .	23
„ „	1850 . . .	16

The same Committee state that Smallpox has prevailed as an epidemic in London:—

Before protection, as	42
During the period of Inoculation . . .	54
During that of Vaccination	14

Dr. Farr, in the fourth edition of M'Culloch's *Descriptive and Statistical Account of the British Empire*, states, that the mortality of Smallpox, Measles, and Scarlatina combined, in 1854, was only half as great as that formerly occasioned by Smallpox alone.

The results of Vaccination in some of the Continental kingdoms were even more startling and complete than in the United Kingdom.

During the twenty-eight years previous to the discovery of Vaccination, there died in Sweden out of each million of the population, 2050 victims annually ; while during forty years after the discovery, out of each million the Smallpox death-rate averaged 158.

In Westphalia, during the years 1776–80, the Smallpox mortality was 2643 ; during the thirty-five years before vaccination, between 1816–50, it was only 114.

In Bohemia, Moravia, and Austrian Silesia, where, from 1777 to 1806 there died 4000, there now die 200. Again, in Berlin, where, for twenty-four years preceding the general use of vaccination, the Smallpox death-rate had been 3422, for forty years since it has been 176.

In other words, the fatality of the disease is in Denmark but an eleventh of what it was ; in Sweden, little over one-thirteenth ; in Berlin and large parts of Austria, one-twentieth ; in Westphalia, but a twenty-fifth. In the last-named country, there now die of Smallpox but four persons, where formerly there died one hundred.

Without desiring in a paper of this description to accumulate evidence unnecessarily as to the great benefits conferred by Vaccination, I cannot resist citing a few particular instances of its value. Thus, in the account of

a severe epidemic which prevailed in Norwich in 1819, Mr. Cross states, that among 215 persons unprotected by vaccination, there occurred 200 cases of Smallpox, and that of these, 46 proved fatal; while among 91 persons who had been previously vaccinated, and who were exposed to the contagion of the Smallpox, 2 only were affected with a very mild disease. Dr. Thompson, who watched the severe epidemic which raged in Scotland from 1818 to 1823, reports, that out of 1500 cases of Smallpox after vaccination, 3 only ended fatally, and neither of them in that form of the disease which is termed malignant; whereas of 400 patients affected with primary Smallpox, no less than 100 died.

Again, at Marseilles, in 1828, there being an estimated population of 40,000 persons not above thirty years of age, 200 protected by previous Smallpox, 30,000 by Vaccination, and 8000 altogether unprotected either by Vaccination or previous Smallpox—there occurred, among the first, 20 cases of Smallpox attended with 4 deaths; among the second, 2000 cases attended with 20 deaths; and among the last, 4000 cases, out of which there died no less than 1000 persons.

Finally, from observations made for twenty-one years on 40,000 persons in Bohemia, it appears that the risk of death to vaccinated persons, if they happen to contract the Smallpox, is at the rate of five and a half to 100 patients, but the risk of death to non-vaccinated persons when they contract the disease is at the rate of twenty-nine four-fifths for every 100 patients. And the concurrent testimony of London, Vienna, and Milan, shows, on an experience of nearly 26,000 cases, that Smallpox after Vaccination, if it occurs, is but a fifth or sixth part as dangerous as the natural disease.

Similar illustrations of the efficacy of Vaccination when well performed, in arresting the progress and mortality of the Smallpox, might be multiplied; but enough has been said to prove that Vaccination, when thoroughly carried out, is all but capable of realising the sanguine hope of Jenner that it would banish Smallpox from the earth. Unhappily, all have not been thoroughly and efficiently vaccinated, and hence it has been proved by the careful records preserved by Mr. Marson of the Smallpox Hospital, "that among vaccinated persons infected with Smallpox, the danger of the disease is chiefly determined by the badness and insufficiency of the vaccination." The results of his researches on this most interesting question are—that the fatality of Smallpox, when it attacks the unvaccinated, is 350 per thousand, and that its fatality to such vaccinated persons as it infects, is, taking these indiscriminately, 70 per thousand; but, distinguishing vaccinated persons into two classes: 1st, those who have been vaccinated in the best known manner, and 2d, those who have been badly vaccinated; the fatality of Smallpox in the former will be five per thousand; in the latter one hundred and fifty per thousand. Thus, taking the risk of the one at thirty times the risk of the other, we are thereby well enabled to appreciate the infinite value of Dr. Jenner's discovery.

The remarkable diminution in the number of deaths, both in this country and on the Continent, since the general employment of Vaccination, affords full confirmation to the assertion of Mr. Simon, "that when this operation is performed in the best known manner, Smallpox need no longer be a danger." There is, I think, little doubt

but that this disease might have been extirpated from the world if thorough care had been observed in the performance of the operation, and a cautious choice of lymph from perfect vesicles, taken at the right time and from only healthy infants, had invariably been made; and, in addition to this watchfulness on the part of operators, our own and other governments had uniformly applied coercive measures to compel Vaccination amongst all classes.

It is true that prejudice and carelessness, especially in the lower class of the community, have interfered, and possibly ever will interfere, to impede the best-devised measures for the complete performance of Vaccination, and thus considerable portions of the population will ever be exposed to the risks of infection. But notwithstanding all the want of care on the part of vaccinators, and the resistance which ignorance and indifference have presented to the universal adoption of Vaccination, the facts we have quoted show that vast results have been realized; seeing that, where formerly there would have occurred one hundred deaths, there now occur not more than four or five. Indeed the very fact that such an amount of good should have arisen from its practice has been made the excuse for supineness, and has created a sense of security, which operates as a delusion and a snare both to the government and the country, and from which the present alarming spread of Smallpox is now beginning to arouse us.

For though it is undoubtedly true, that for many years past the mortality of this disease has been infinitely small compared with that which marked the time preceding Jenner's discovery, yet society has for

years past been sustaining a very serious loss of life from Smallpox,—a loss of life which, it is not too much to say, might undoubtedly have been prevented.

According to Dr. Headlam Greenhow (whose labours in the statistics of the mortality of diseases are beyond all praise, and afford proofs of the vast amount of preventable death which is constantly occurring in this country), the mortality of Smallpox amounted to 34,000 persons during the seven years preceding the year 1858, most of which deaths, Dr. Greenhow observes, would have been prevented had there been a perfect system of vaccination. Mr. Simon, in his Report for 1858, states that 41,290 persons were destroyed by Smallpox during the nine years between 1848–56, being at the rate of 4587 a-year, and that in certain considerable districts of England, during the three months ending March 1858 (sixty years after Jenner's discovery), deaths by Smallpox amounted to a fourth part of the entire district mortality. In another Report for 1859 he says, "Smallpox has been shamefully prevalent—in one sub-district it alone has occasioned as many as nineteen deaths out of sixty from all causes; in another, as many as twenty out of eighty-five; and in various instances the registrars who mention the disease particularly refer to the local neglect of vaccination."

But whatever may have been the case during past years, it is clear that at the present time this enemy of human life is pursuing its work of destruction with a vigour which is truly alarming. From thirty to forty deaths have been registered weekly in London, as the returns of the Registrar-General will certify, for months past. This officer informs us, that during the last quarter of 1859 a virulent epidemic has prevailed, and is

still spreading, over many parts of Scotland, carrying off numerous victims. He adds, that there can be no doubt that of late years epidemics of Smallpox have been becoming both more frequent and more virulent. In 1856 Smallpox appeared as an epidemic in Scotland, and found so many victims unprotected by vaccination, that in the town of Dundee alone the deaths from that disease during the year constituted no less than 9·3 per cent of the mortality; while *in some other places nearly a third of the deaths were caused by it.*

Grave fears are expressed by many medical men that these epidemics will continue to recur; and many go so far as to express serious doubts of the protective efficacy of vaccination, as at present practised and enforced.

A most interesting question here presents itself,—namely, to what causes this diminished permanence of infantine vaccination is to be attributed, and why it thus diminishes as years advance; why vaccinations performed soon after Jenner's time are found to defend those exposed to Smallpox infection more lastingly than our modern vaccination?

Before discussing this question, or attempting a reply to it, I must frankly confess that experience has shown that some families are more liable to the contagion of Smallpox than others, as second attacks of the disease itself recur to them; and that when the Smallpox is raging epidemically, it affects individuals who are supposed to be protected by vaccination, and who have previously exposed themselves to the contagion of the disease with impunity. Whether this arises from the susceptibility of the disease being sharpened in some unknown manner during such visitations, or that a smaller amount of that contagion is capable of pro-

ducing the disease than under ordinary circumstances in certain constitutions, it would be difficult to say. But I feel persuaded, that the present severity of Smallpox and the impermanence of vaccination cannot be considered as accidental circumstances, and that we cannot inquire with too much anxiety or earnestness into the causes which have induced this lamentable state of things.

In reply to the inquiry as to what are the causes of the greatly increased diffusion of Smallpox during the last few years, and why the protective influence of infantine vaccination has diminished, and cases of Smallpox after that operation have become so numerous, I believe that four causes may be assigned :—

1st, Bad vaccination ; 2d, the deterioration of the lymph used in vaccination from long descent ; 3d, the want of an adequate supply of good vaccine matter ; 4th, the want of Government interference, and of efficient legislation to enforce the universal practice of vaccination.

The first of these causes is, probably, the most important. For, unhappily, bad vaccination has peculiarly distinguished this country. If, as Mr. Marson declares, the mortality of the ill-vaccinated is fully thirty times greater than that of the well-vaccinated, it becomes a matter of great importance carefully to investigate in what bad vaccination consists.

The term “ bad vaccination ” is not, as will be readily understood, intended to apply to the mere performance of a most simple operation, which a needle’s point armed with infective virus and inserted beneath the skin is a sufficient effort of surgery to accomplish. As has

been well said, all that belongs to the mere manual trick of vaccination is learnt from a minute's teaching and an hour's practice. The term must be understood as referring to the choice of the matter employed and the observance of the rules so carefully propounded by Dr. Jenner in his original Essays. These consist in attention to the time at which the lymph is taken, and to the perfection and shape of the vesicle. As is well known, the pure vesicle may be impaired in efficiency by mechanical injury, by cutaneous diseases, by teething, and by other disorders disturbing the system, as well as by the general condition of health in the subject during the course of its formation. It may also be too rapid in its formation and present too large an areola.

Dr. Jenner was himself so thoroughly aware of the peculiar influences which affect the character of the pustule from which lymph is taken, that he went so far as to publish a special Essay on the varieties and modifications of the vaccine pustule. In that Essay he asserts that the vaccine fluid is liable, from causes apparently trifling, to undergo decomposition; that in this state it sometimes produces what has been denominated the spurious pustule; that is, a pustule not possessing the characteristics of the genuine one. Anomalies assuming different forms may be produced, according to the qualities of the virus applied or the state of the person inoculated; but by far the most frequent variety or deviation from the perfect pustule is that which arrives at maturity and finishes its progress in a much shorter time than the true. Jenner says, "I have abundant testimony to prove that the fluid taken from a spurious vesicle is capable of *propagating and perpetuating its*

like. Indeed the vaccine fluid even in a pustule going through its course perfectly, if taken in its far-advanced stages, is capable of producing varieties *which will be permanent if we continue to vaccinate with it.*" He adds, moreover, that vaccination on an herpetic skin produces every gradation in the state of the pustule, from that slight deviation from perfection which is quite immaterial up to the point which affords no security at all.

Mr. Ceely, possibly the most eminent of Jenner's English disciples, remarks, that when vesicles are unusually rapid in their course, are at their greatest development on the seventh day, yellowish on the eighth, with turbid lymph followed by central desiccation on the ninth, and with a miserably small crust falling on the fifteenth or eighteenth, the lymph will be found uniformly deficient in infective property, and that common prudence dictates its discontinuance, and the adoption of a new supply.

Lastly, the Committee of the Medical Association, in their Report on Vaccination, read at Liverpool in 1839, and signed by their chairman, Dr. Baron, the friend and biographer of Jenner, and an indefatigable worker in all that respects vaccination, state, that "in 1817, 1818, 1819, a vast quantity of vaccinations were made in different parts of Europe with lymph of this imperfect and inefficient character. How far it was diffused it is impossible to tell; but it is highly pertinent to observe, that a great number of the failures which are said to have occurred of late years probably happened among persons who received this deteriorated lymph, it having been observed that individuals who had been vaccinated about the periods above mentioned have been the principal sufferers from Smallpox."

A valuable commentary on the opinions of the eminent authorities whom I have quoted is afforded by the testimony of Mr. Marson, who shows, that out of 3094 vaccinated persons whom he had seen suffering from Smallpox, between the years 1836-51, only 268 presented what he considered the marks of perfect vaccination. We regret to be obliged to add, that his opportunities of observation having enabled him to judge of the vaccinations of other kingdoms of Europe, he assigns a very low relative rank to the performance of vaccination in England; while, as he observes, there can be no justifiable reason why the rural inhabitants of England and Wales should be, as he knows them to be, far less well vaccinated than the rural inhabitants of Denmark, Sweden, and Prussia. He mentions, "that patients constantly present themselves with Smallpox at the hospital, who state they have been cut five, six, or eight times, or more, for Cowpox without effect."

If other evidence were needed to prove the existence of this large amount of bad vaccination, and the grave results which flow from it, the valuable testimony of the medical officer of the Privy Council might be quoted. "On any long series of vaccinations, *without selection of subject*," says Mr. Simon, "degeneration will certainly have been produced. Still more frequent danger to the efficiency of successive contagions arises from taking lymph from vesicles too advanced in their processes, or from vesicles that have been disturbed in their course by mechanical or other irritation, or by accidentally concurrent diseases (especially skin diseases) in the subject."

The inference to be drawn from the various authorities I have cited and the facts they have collected is, that inattention on the part of vaccinators to the

essential conditions of efficient vaccination must have produced a degeneration of the fluid used for vaccination, and that the result has consequently been a system of bad vaccination, which, perpetuated by repetition from the same imperfect matter, has diffused itself for many years past throughout the length and breadth of this country. Hence the present unprotected state of our nominally vaccinated population; hence the diminished permanence of the protective efficacy of infantine vaccination; and hence, alas! the extended spread of Smallpox among us.

It must be remembered that until recently no regular system of public vaccination has been established in England. All persons—medical men, clergymen, amateurs, druggists, old women, midwives, &c.—have been allowed to vaccinate in any way that each individual might think proper, and persons so operated on have been considered as vaccinated. It would be of course absurd to suppose that persons of this description could possess any discrimination as to the choice of a vesicle, or a comprehensive knowledge of the minute and delicate particulars connected with the pathology of the Vaccine disease.

The conclusion thus becomes inevitable, that for years past a very large proportion of the vaccination in this country has been carried on with lymph which, in various degrees, must be non-protective, and so far worthless. Nor can we doubt but that the Privy Council must have been of this belief, or they would not this year have issued some of their recent valuable regulations.

Not disputing that the true Jennerian vesicle is still extant, and, when recourse is had to it for a supply of lymph, will produce complete vaccination as perfectly as

in Jenner's life-time, yet there is reason to believe that this perfect vesicle is becoming the exceptional one, and not that which is most commonly seen and resorted to. The testimony of many of my professional brethren, in addition to my own experience, is my warrant for this assertion, and the history of the manner in which vaccination has been carried on for so many years past must lead to the conviction that this is not a rash statement.

I pass on to the second of the causes of the diminished efficacy of vaccination to which I have referred, namely, the deterioration of cowpox matter by descent. On this subject, the opinions of many eminent professional men, both in this country and on the Continent, who have devoted much observation and thought to the subject of vaccination, would tend to establish the belief that the vaccine contagion itself becomes inevitably and necessarily deteriorated by long transmission through human subjects.

As early as 1818 M. Brisset declared that the symptoms of cowpox vaccination were much shortened in duration; that the vesicle, the duration of which is so essential to prove the activity of the virus of cowpox and its preserving efficacy, was much less prominent, if even it could be said to exist.

Dr. Meyer of Kreutzburg stated, that on examining nearly 4000 vaccinated persons of all ages in 1824-1825, he found the older scars much better marked than the recent ones. He also affirmed, on the authority of the district vaccinators, that the proportion of unsuccessful to successful vaccinations was every year growing larger; and asserted that, on obtaining new lymph from the cow, this almost always acted with

effect, and that the resulting cicatrices were after the old normal type. The observations made within the last twenty years have verified these facts more completely.

Dr. Gregory, whilst drawing a distinction between two kinds of lymph, in 1838, says of the old, that he had noticed a diminution of its intensity—that eight or ten incisions did not produce more irritation than the three which were usually applied fifteen years before. He states that “on the Smallpox Hospital of London changing their old stock of lymph for more recent matter in 1837, he found that the local inflammation resulting from its use was more severe, and the constitutional symptoms more violent; the virus was more energetic; the most minute incision took effect; and the lymph given out on the ninth and tenth day was still in an active state.”

Dr. Gregory expresses his conviction, derived from facts brought to his knowledge, that lymph, by passing through the bodies of many persons, loses in process of time some essential portion of its activity.

Mr. Estlin, in speaking of the virus newly obtained from the cow in 1838, which he employed, says that he considered it more energetic in its effects, and more inclined to produce vesicles resembling what Cowpox was many years ago, than that employed by the National Vaccine Establishment. Some time after this, Mr. Estlin published important testimony from the Vaccine Institution of Glasgow, stating that “in forty-three trials made with the renewed lymph there had not been a single failure; whereas, in the last preceding forty-three vaccinations made with a former lymph, there had been failure in ten cases, and spurious or imperfect vesicles in nine others; that at this Institution, in the

course of the preceding three years and a half, there had, at four different periods, occurred an entire degeneration of the lymph, and a consequent failure of the vaccination." Indeed, at the very time the new supply reached the Institution, "all the children vaccinated upon the day week preceding presented, instead of true vesicles, raw surfaces, resembling spots that had been blistered and then denuded of their cuticle."

M. Bousquet, in remarking on a new supply of lymph, discovered and taken from the cows at Passy, near Paris, in 1836, says, "The new virus takes effect, at once more quickly and more slowly than the old—more quickly, because it sooner gives signs of life; more slowly, because it extends its effects over a longer time."

Professor Hering, of Stuttgart (writing about cowpox matter from cows), says:—"Vaccination coming originally from cowpox matter is distinguished by its larger pustule, by more powerful local inflammation, more violent fever, as also by its slower process. The more powerful effects of such vaccinations are often still perceivable in the second and third transmission. Vaccination with such more recent matter is more effective and decided, and certainly less apt to remain unsuccessful, than vaccination with matter of long standing."

M. Fiard, communicating in 1844 to the Académie des Sciences the results of an experimental comparison which he had just instituted between the action of lymph then newly derived from the cow, and other lymph of eight years' descent, says:—"There is a difference as regards the duration of the vaccine pustule, of three to five days, between the fresh and the older lymph." He advises that the old lymph should be replaced by new,

and that lymph should be renewed every five or six years.

M. Castèl says (*Report of Committee on Vaccination of the French Academy for 1843*):—"That whatever may be the opinion of practitioners on this controverted question, it is an act of prudence to permit no opportunity to escape of renewing the vaccine virus."

The Committee of the French Academy which reported in 1845 also recommended, as a prudential measure, the frequent renewal of vaccine lymph, and resorting to the cow for this purpose.

Dr. Steinbrenner observes (*Traité de la Vaccine*, Paris, 1846), that "vaccine virus undergoes a positive deterioration by transmission through successive individuals, and it is therefore desirable to obtain fresh lymph from the cow frequently." He says that "the pustules of old virus are less developed, and dry up more rapidly; that the general effect which accompanies them is slighter—they leave scars less deep."

Mr. Simon, estimating the value of most of these observations, says, that "they have established, beyond the possibility of reasonable doubt, that certain original properties of the vaccine contagion have very generally declined after its long successive descent from the cow; that they make it, at least, very questionable whether an indefinite length of transmission of the vaccine contagion, without renewal from the cow, has not been of public detriment." In reply to the question, whether an extensive use of degenerated lymph has determined the too frequent impermanence of protection against post-vaccinal Smallpox, he answers, "It is difficult to conceive how the infantine generations of a country could, crop by crop, successively derive less permanent constitutional

impressions from Vaccination unless the efficient cause of those impressions—the vaccine contagion itself—had year by year undergone enfeeblement of its powers.” He sums up by saying,—“From the observations I have quoted, it would then apparently result, that after long periods of human transmission the Cowpox has proved unable to excite in the vaccinated body its maximum of protective change; and that lymph of shorter descent has been more successful in disinfecting the body of that ingredient which constitutes its susceptibility to Smallpox.”

I have already referred to the remarkable results noticed in the revaccination of the Prussian army. It extends annually to some forty or forty-five thousand operations. Its records run back twenty-four years. It is reported on annually, and it proves that the impermanence of infantine vaccination has increased almost without exception year by year, during the last quarter of a century; so that the vaccinations of 1836, tested by eventual resusceptibility to Cowpox, were not half so stable as the vaccinations of 1813.” And Dr. Watson, reasoning on these important statistics, says that “it appears, that where the vaccine supply has seldom or never been renewed from the cow, the resusceptibility of vaccine disease at a given age (and therefore, it may fairly be presumed, the susceptibility of Smallpox also) has undergone a progressive increase.”

My friend Mr. Norway, who has for many years past been engaged in public vaccination, and who, from an early period of his life, has given much attention to the subject, tells me that of upwards of 100 vaccinations, which have very recently passed under his eye, a considerable number showed a small, irregular, and

imperfect vesicle, which ran through its first stages of development slowly, afforded little or no lymph, and left but a small and shallow mark after the crust of the pustule was removed. These vesicles produced, moreover, scarcely any constitutional disturbance or fever at any stage of their progress, and, in his opinion, gave evidences of deteriorated lymph, and were altogether different to the well-developed vesicles he had been accustomed to see in his youth. My own observation of many cases of vaccination which I have recently watched thoroughly proves the accuracy of the foregoing statements, and enables me to confirm the correctness of Mr. Norway's description of the spurious vesicles which came under his notice.

On a candid and dispassionate review of all these facts and observations, it seems difficult to dissent from the practical conclusion at which Mr. Simon arrives after an elaborate investigation of the whole question:—"That perhaps more permanence might be given to the protective effects of infantine vaccination by well-devised arrangements for the periodical renewal of lymph."

On the other hand, there are no doubt very eminent authorities, who deny that good and perfect vaccine lymph can suffer any decline in its effective power from any length of transmission and descent.

The National Vaccine Establishment have, indeed, treated the question as conclusively settled. In their Annual Report for 1854 they declared it "to be a fallacy to predicate the necessity of resorting to the original source of the cow for a renewed supply of lymph."

"Non nostrum est tantas componere lites."

All that I would observe is, that if the views of the eminent authorities I have cited are correct, the fact of all renewal of lymph having been omitted by the National Vaccine Establishment since Jenner's time is an important circumstance, when it is sought to estimate the causes which have produced the epidemics of Smallpox of late years.

To the facts and opinions referred to I cannot refrain from adding one or two remarks. Dr. Jenner, when vindicating his valuable discovery from attack, distinctly asserted that Smallpox after vaccination was not more common than Smallpox after smallpox,—that it was neither more so nor less so. It is certain that in our day this is no longer the fact. The number of cases of Smallpox occurring after vaccination at the present time are very numerous, as is well known.

Smallpox, like measles or scarlet fever, commonly defends the subject of it from a second attack ; and if the protection afforded by vaccination was equal to that given by Smallpox itself in Jenner's time, how are we to account for the present frequent occurrence of Smallpox after vaccination, unless it be that the lymph used in its performance has suffered degeneration, either from bad vaccination perpetuating itself, or from the contagion of the vaccine lymph being impaired in consequence of too prolonged a transmission through the human system?

A principal argument of those who deny that the virus of Cowpox can possibly undergo any deterioration by length of descent is, that the poison of Scarlet Fever, Smallpox, and Measles, is always the same, and that the specific contagion and the symptoms of these diseases never alter. To this assertion it may be replied, that

Cowpox, as experiment sufficiently proves, is a modified form of Smallpox ; that it is the only disease, of which we have any knowledge, which is thus modified by passing through an animal organisation ; and if it becomes deprived of danger and infective property by such process of animal transmission, is it unreasonable to believe that it will undergo still further modification, though in a lesser degree, by passing through countless human bodies, until it may ultimately cease to be protective ?

It has been proved that Smallpox itself may, after a series of inoculations, approximate in its nature to the mildness of Cowpox, and that the severity of the symptoms and the number of the pustules may gradually diminish, until only one is seen at the point of insertion. Dr. Jenner remarks on this phenomenon, " The Cowpox and Smallpox perform similar parts ; and in either case the virus may steal, as it were, imperceptibly through the constitution, and give no signal of its presence." Dr. Adams, the Physician of the Smallpox Hospital, succeeded, as is well known, in producing a benign form of Smallpox, attended with scarcely any eruption of pustules, and little or no constitutional affection, by selecting only the mildest forms of Smallpox from which to inoculate ; and he entertained the belief that he had succeeded in giving to this innoxious form of the disease permanence and uniformity. If this virulent malady could be so qualified by selection and transmission, may not the Vaccine disease to a similar extent become diminished in its peculiar active and protective properties ?

In tracing the causes of the prevalence of Smallpox

we must next advert to the defective supply of cowpox lymph to meet the public want.

The only supply hitherto for the general requirements of the country has been furnished by the National Vaccine Establishment, centrally stationed in the metropolis.

The resources of this institution have, however, of late become seriously crippled and diminished by causes to which I shall more particularly refer when I come further on to speak in detail concerning its past history and proceedings. From a minute of the Board of Nov. 17, 1858, it appears "that in 1838 the number of vaccinations performed by this National Establishment was 18,659; that during the three years 1850-52, the annual average number was 10,713; that during the three years 1854-6, the average number was 8207; and that in 1857 the number was 6327; and that while the operation of successive laws has reduced the number of vaccinations, from which lymph has been supplied to the public, the demand for lymph has been increasing; that ordinarily the Vaccine Establishment distributes about 215,000 charges of lymph, but that, under the influence of peculiar circumstances, the demand has risen to about 320,000 charges—an amount nearly 60 per cent higher than was supplied in 1838, when the sources of supply were nearly three times as numerous as they are at present." From this important statement of the National Vaccine Establishment it seems impossible to doubt, that the general effective vaccination of the country must have suffered materially from the crippled resources of this valuable establishment. It is even not impossible that their limited power of selection, under the pressure of so great a demand,

may have led them to arm their charges from vesicles which a more extensive supply of subjects would have permitted them to refuse, and thus this important establishment itself may have been the unwilling means of diffusing much doubtful lymph.

Measures have been, indeed, taken by the Government, which will also be more particularly referred to further on, for establishing other centres for the supply of this essential requisite. I shall hereafter consider how far these measures are likely to prove adequate to supply the deficiency which has unquestionably heretofore existed.

We next proceed to consider how far the absence of Government or legislative interference may have contributed to the ill success of vaccination in this kingdom. We fear it cannot be denied that our Government has, until recently, been greatly wanting in this respect. There is no doubt that far more zeal in behalf of Vaccination has been shown by Continental governments than by our own.

According to Drs. De Carro and Sacco, in a report made in the year 1812, Vienna had been free from Smallpox for five years, and Milan for eight. Dr. Sacco, writing in 1824, states that the Austrian Government, in order to effect this desired object, went so far as to order that no child should be admitted into any public school, nor have any share in any public institution, nor partake of the sacraments of the Church, unless he had been vaccinated. Such a system of coercion, though strongly to be deprecated when carried to such lengths, did, however, obtain the result it aimed at, by extirpating the Smallpox for long periods.

We are told also by Dr. Baron, that in 1803 the governments of Sweden and Denmark so effectually enforced Vaccination, that those countries remained free from Smallpox for twenty years. In Anspach, in Bavaria, a district which contains upwards of 300,000 inhabitants, no person died of the disease from 1809 to 1818; and Mr. Simon states, that during eight successive years in the Grand Duchy of Baden, and for thirteen years in the city of Copenhagen, no death from Smallpox occurred. These exemptions are asserted by those writers to have arisen from the coercive measures adopted by the different governments.

In this country, the birthplace of Jenner, up to the year 1840, the one sole act of the Government and Legislature was the institution of the National Vaccine Establishment in the year 1808.

This valuable institution was originally founded (as declared in Parliament in 1808 by those who first promoted it) to forward the general adoption of Vaccination throughout the empire, by giving to the practice the public countenance and support of Government. To most persons of intelligence the results of experience, both at home and abroad, appeared, even at that time, decisive of the great advantages of Vaccination; but whether or no it were infallible, as a preventive of Smallpox, was a question still involved in uncertainty. In order, therefore, to ascertain with precision the facts by which those doubts might be dispelled, to conduct such investigations under the eye of the public, and to insure accuracy to the publication of the results when ascertained, it was proposed that all cases of reputed failure should be referred to the Board. The Board were also to organise and set in action a central insti-

tution for carrying on in London, under their own immediate superintendence, the practice of Vaccination, and for distributing vaccine lymph to every part of the empire. Of these objects there are several with which, in the course of time, it became unnecessary that the National Vaccine Establishment should occupy itself; and for more than twenty years the usefulness of the establishment has been restricted to the sole but very important function of maintaining for general use, and distributing as wanted, a supply of trustworthy lymph.

According to the medical officer of the Privy Council, gratuitous vaccination has been performed by this establishment at several special stations in the metropolis. Each stational vaccinator has contributed to the central office as many charges of lymph as he could obtain from subjects vaccinated by him; and the central office has distributed these charges gratuitously to all proper applicants. By thus keeping up the supply of lymph for general diffusion, so as to be ever ready, when Smallpox was prevalent, for those who had no other means of obtaining it regularly, the Board has rendered immense benefit. But it possessed neither the means nor the power of extending vaccination throughout the country. The vaccination carried on by it has been entirely restricted to London, and for the last twenty years has been subsidiary to the one important function of providing lymph for general vaccination; and for some years past, as has already pointed out, its resources even in this respect have been seriously diminished.

It may be distinctly asserted that, until the year 1840, England was indebted for public vaccination, either to the zeal of medical men, or to the charity of

the public. It was held that "an overseer was not bound to take measures to procure the poor children of the parish to be vaccinated during the prevalence of Smallpox." Thirty-six thousand deaths by Smallpox signalled the three years of this charitable vaccination, prior to 1840, and three-fourths of those who so died were children under five years of age, who had never undergone the operation.

In this year, however, the Legislature provided (by the Act of the 3 & 4 Victoria, c. 29) that vaccination at the public cost might be claimed of local authorities in every parish in England and Wales, and that this gratuitous vaccination should not place its recipients in the position of persons receiving parish relief. Great diminution in the number of deaths from Smallpox followed this measure. For three years before its enactment the mortality of this disease was 770 per million of people, whereas after it the mortality reached only 304 per million. But even this reduction indicated an annual loss of life by Smallpox of 5221 persons, 4500 of whom were infants and children, who perished in consequence of the procrastination or apathy of their parents, who having no objection to parochial vaccination, or to the operation itself, yet delayed its performance beyond the period of infancy.

In order to diminish this large amount of infantine death, the Compulsory Act of 1853 was passed (16 & 17 Victoria, c. 100). This Act provided that every child should be vaccinated within four months of its birth; imposed a penalty on those who did not comply with this enactment; and directed that, at the registration of every birth, the Registrar should give a printed notice of this legal obligation.

This Act was at first readily obeyed. In 1854 the public vaccinations of England, at all ages, exceeded by more than 75,000 the total number of births. The result of this Act was, that the deaths from Smallpox reached an average of only 152 per million of people. But in 1855 the number of vaccinations declined, and in 1856 it was still further reduced. The misfortune was that no public officer was appointed to carry out the provisions of the Act. There being no one whose duty it was to enforce the penalty, its coercive effect was soon lost. It is more than probable that, if its commands had been enforced with firmness by a proper officer, there would be few unvaccinated persons at the present time, and the mortality from Smallpox which has recently occurred would have been materially smaller.

One great improvement, however, unquestionably arose out of this Act; whilst it reserved to the local authorities the right of selection, it prevented them from choosing other than legally-qualified medical practitioners for the office of parochial vaccination.

A serious inconvenience followed, nevertheless, from these Acts of Parliament. In exact proportion as they diffused and developed general parochial vaccination, so they diminished the resources of the National Vaccine Establishment. When discussing the causes which may have produced the large amount of bad vaccination, I cited the statistics of that establishment. In 1838 the number of vaccinations amounted to 18,659, whereas in 1858 they were only 6445. Now it so happened that, while the number of vaccinations at this establishment was so seriously reduced, the demand for lymph was increasing. In ordinary years it distributed 215,000

charges ; but owing to the alteration of the law, and the minute division of vaccination, the demand rose to 320,000 charges—an amount nearly 60 per cent higher than was supplied in 1838, when the sources of supply were nearly three times as numerous. Thus the resources of this valuable establishment have ceased to be sufficient for the requirements of the public.

The National Vaccine Board, itself alive to the causes which have thus reduced their supplies of lymph, and of the grave consequences which must thence ensue, in a minute dated the 17th Nov. 1858, suggested to the Lords of the Privy Council, that abundant supplies of lymph existed in the great parochial vaccination stations, established (under 3 & 4 Victoria, c. 29 ; and 16 & 17 Victoria, c. 100) at Liverpool, Manchester, Birmingham, Leeds, Sheffield, Newcastle, and other large towns, and expressed hopes that the Lords of the Privy Council would institute the necessary inquiries into the state of public vaccination in those towns, in furtherance of the objects of the National Vaccine Establishment. The result of an inquiry thereupon instituted was, “that the largest vaccination station at Manchester became contributory to the lymph supply of the National Vaccine Establishment, and it is expected that from 20,000 to 30,000 charges of lymph may annually be furnished from this source alone.” Similar arrangements have already been made with the other large towns mentioned in the minute of the National Vaccine Establishment, and ultimately every considerable town in the empire will contribute supplies of reliable lymph to the National Establishment, by which means the likelihood of scarcity will be materially diminished.

Whilst we deplore the supineness of past adminis-

trations in regard to Vaccination, and the sad amount of mortality which may be reasonably attributed to it, we must congratulate the country on this new era in the system of vaccination. Great credit is due both to the Government and the Vaccine Board, and above all to the distinguished medical officer who advises the former, and who participates in the deliberations of the National Vaccine Board, for these complete arrangements, which combine under one system the public vaccination of the country and at the same time an efficient supply of vaccine lymph.

Nor is this the only advantage which arises out of this combined arrangement. Hitherto the practice of vaccination, and the study of the pathology of the Vaccine disease, have never been taught practically in our medical schools. Indeed, there has been no opportunity of such teaching. Henceforth these large vaccination stations will be available for that purpose. A "Notification" issued by the Privy Council tells us, that the public vaccinators in London, Birmingham, Bristol, Hull, Liverpool, Manchester, Newcastle, Oxford, and Sheffield, and wherever there are medical schools, are authorised to give certificates of proficiency in vaccination to students, by which their special fitness for public vaccination is secured. Under the provisions of the Public Health Act of 1858, and of an Act since passed to perpetuate the same, the Privy Council issued regulations on the 1st of December, 1859, "that on and after the 1st day of January, 1860, persons to be contracted with for vaccination, and persons to be allowed to act in their stead, shall (except in certain cases) produce evidence of being duly qualified in all that relates to the practice of vaccination; which evidence

must consist in a certificate given, after due instruction or examination, by some public vaccinator, whom the Privy Council authorise to act for that purpose."

The Royal College of Surgeons had previously agreed to require from the candidate for its diploma the production of a certificate, to be given in every large town where there is a medical school, by some public vaccinator, who for this purpose should be selected and supervised by the National Vaccine Board, and whose certificate should testify that the candidate had practically studied Vaccination and its results.

Having traced the causes of the diminished efficacy of Vaccination and increase of Smallpox, we pass on to the important inquiry whether any, and what remedies, can be found for the prevention of further calamity?

On the part of the medical profession, revaccination has been most commonly resorted to as an expedient. And the practice is one which cannot be too strongly recommended. It has long been found that certain persons, as they reach adult life, recover the susceptibility to Smallpox which early vaccination had once suspended in them. It is asserted, as the result of a practice adopted for nearly thirty years past in Germany, and now strongly advised in this country, that this renewed susceptibility to the disease may be controlled by revaccination at about the age of puberty. The fact that so many persons, who may be presumed to have undergone perfect vaccination, prove capable at a later age of taking Cowpox afresh, leads strongly to the inference that, independently of any inferiority in the lymph used in vaccination, the effect of the vaccine disease has a

natural tendency to wear itself out in the human system. Whenever vaccination takes effect a second time, it is obvious that its original effect on the system has expired; and there can be no doubt that whenever there is in the system a susceptibility to Cowpox there must also be a susceptibility to Smallpox, the two diseases being now understood to be essentially the same. Many diseases are known to wear themselves out in time in the human system, and it may well be that the very mild form of variola known by the name of Cowpox, from its very mildness, may have a tendency to wear itself out much more rapidly than the more malignant and powerful form of Smallpox. As a matter of precaution, therefore, revaccination after a certain number of years is what every prudent medical man should recommend, and every prudent individual should adopt. But revaccination cannot be relied on as a means of insuring good vaccination, or the universality of vaccination. Among the masses it is already a matter of extreme difficulty to insure the generality of infantine vaccination. It will be impossible, by any medical police that can be suggested, to compel the general revaccination of adults.

Again, unless good vaccination be uniformly introduced, and its rules carefully attended to in secondary as well as in primary vaccination, what security have we for the efficacy of the former any more than of the latter?

Therefore, while cordially approving of revaccination as a subsidiary remedy, I must maintain that the remedies for the present evil must be sought for with reference to primary, and not merely in revived, vaccination.

Happily, we shall soon find that there is no cause

for despair ; and that, with ordinary care and prudence, the means of deliverance are within our reach and control.

As regards the performance of Vaccination itself, all that is required is that the operation, on which so much depends, shall invariably be performed by properly instructed and qualified practitioners alone ; so that two things may be insured : 1. That none but perfect lymph shall be used in vaccination ; 2. That in every instance the success or non-success of the operation shall be ascertained, and in the event of non-success the inoculation shall be repeated, till a satisfactory result shall have been brought about. To these ends the rules which Jenner propounded, and which the observations of his most eminent disciples have fully confirmed, should be religiously attended to in respect to the characteristic appearances of the pustules, whether regard be had to the future safety of the patient or the quality of the lymph as a source of future supply. These characteristic symptoms have already been sufficiently adverted to : the importance of attending to them cannot be too strongly enforced. A little practice in vaccine inoculation attentively conducted impresses on the mind the perfect character of the vaccine pustule ; therefore, when a deviation arises, common prudence points out the necessity of re-inoculation.

The following passage of the Report of the Committee of the Medical Association for 1839 is peculiarly deserving of the attention of the medical profession, especially of its younger members :—“The most patient and painstaking of the profession,” say the Committee, “never take lymph from an imperfect vesicle, nor at an

improper time; nor are they satisfied if the areola appears too early, or if it is irregular in its form; and they never consider a patient safe unless they leave one or more vesicles untouched. Unless these essentials are invariably attended to, no one is entitled to assert that vaccination has been duly performed." They add, that "all cases of reputed vaccination, unless they have passed under the review of a competent judge, should be considered *no vaccination at all*." The Committee further recommend the employment of *genuine vaccine, or equine lymph, whenever it can be obtained*, cautioning gentlemen to acquire such a knowledge of the disease among the lower animals as will prevent them from employing matter from other eruptive affections, which afford no protection at all, and which caused much perplexity to Dr. Jenner in his early investigations. The means of producing the true disease are now, by the labour of Mr. Ceely, placed within the reach of every one; and these incorrect pustules to which cows are liable, and which it is to be feared *have too often afforded* spurious matter for inoculation, will henceforth be avoided.

Mr. Simon advises that no line of transmission shall be continued through a subject in whom imperfect infection is produced; and insists that at any such point the vaccinator *must stop; and that from all such points a reapplication must be made to the parent stock*,—not necessarily at its source, but at least at some stage of its descent, in which its infective powers are unimpaired.

The recent regulations of the Privy Council to insure the education of practitioners of vaccination are most judicious and praiseworthy. Our students will hence-

forth be obliged to attend at some certified School of Vaccination, in which both the practice and science of vaccination are taught, and from which they will be compelled to carry an authentic certificate before they can present themselves for examination at the Royal College of Surgeons.

It may be confidently anticipated that the enforced study of Vaccination, and of the delicate pathological precautions connected with its practice, so wisely insisted on by the order of the Privy Council for our students and all in future holding public offices connected with parochial vaccination, will ultimately secure scientific accuracy in all that relates to this branch of medical practice, as well as continuous vaccination with none but the best lymph.

That an immense advantage will thus be attained no one can doubt ; but, unhappily, the whole of the difficulty is not thus got rid of. If it be true, as is maintained by so many observers both at home and abroad, that the tendency of all lymph is to deteriorate by transmission, it is obvious that no care in the selection of lymph can in the long run prevent this eventual result ; while, on the other hand, the greater the care exercised in the selection, and the more completely the desired object of excluding from use the deteriorated or imperfect lymph, of which too much is in circulation, is effected, the more will the general supply of lymph be diminished. If to this be added the fact which has before been adverted to, that, even taking into account the imperfect lymph now in circulation and which it is desirable to exclude, the supply is at the present moment defective, it becomes clear that the great desideratum must be to obtain a

supply of fresh and perfect lymph, equal to the exigency of the general demand. Without this, either the spurious article cannot be driven out, or the universal application of vaccination cannot be realised.

A careful husbanding of perfect lymph, whenever it can be taken consistently with the security of the patient, will, no doubt, go a considerable way: it remains to be tried whether it will accomplish all that is desired. If the supply should prove inadequate to the necessity, or if the theory that the virus becomes degenerated by transmission should prove, on a more extended experience and accurate observation, to be confirmed, happily, Providence has placed the means of safety within our reach. We now know by experiment, here wholly in accordance with *à priori* scientific induction, that even if the natural disease among cattle should not present itself, we can, by artificial inoculation with smallpox matter, produce the variolous affection in the animal, from the matter of which we may obtain the means of safety.

Thus able to protect ourselves, in case of necessity, both Government and people will indeed be to blame if, from the one or other of these sources, according to circumstances, they do not procure the means of protection from future danger.

We have next to consider what remains to be done in the way of legislation in a matter so important to the public weal. It is plain, that though all shall have been done to provide a sufficient supply of lymph, and to secure its efficiency, the work will still be incomplete unless two things can be insured: 1, the prevention of the voluntary propagation of Smallpox by

inoculation ; 2, the universality of Vaccination. The first, because the security to the individual is purchased at the cost of an infinitely greater danger to the rest of the community, each case of Smallpox being a centre from which the poison may radiate, thus tending to keep alive and perpetuate the mischief ; the second, because every unvaccinated person, being liable to take Smallpox, becomes, on infection, like the inoculated patient, the means of transmitting the disease.

Much has already been done by the Legislature in these important particulars, but it may be questioned whether the work of legislation is as yet complete.

By the statute 3 & 4 Vict. c. 29, s. 8, inoculation with smallpox matter is made an offence, punishable, on summary conviction, by a penalty of twenty shillings. There does not seem any reason to believe that inoculation is now in effect practised, and it may be hoped that no medical practitioner would be a party to the violation of the law. Nevertheless as, in the event of a further spread of Smallpox, it is impossible to say what the sense of individual danger and the desire of individual security may lead persons to do, it may not be amiss to call attention to the lowness of the penalty, and to suggest that, in a matter of such paramount importance, the observance of the law might be enforced by the sanction of a graver punishment.

With respect to the enforcing of Vaccination, besides various statutory provisions for securing gratuitous vaccination to the poor, through parochial authorities, vaccination, by the 16 & 17 Vict. c. 100, is at length made compulsory. The father or mother of every child, or the person having the care, nurture, or custody of a child, is bound to take the child—the former within three

months, the latter within four months of its birth—if not already vaccinated by some duly qualified medical practitioner, and the vaccination duly certified—to the medical officer or practitioner appointed by the union or parish, in order that the child may be vaccinated. On the eighth day following, the child is again to be brought to the medical officer or practitioner, who, if the vaccination has been successful, is to give a certificate to that effect, and transmit a duplicate to the Registrar of births and deaths of the sub-district. The Registrar, having the means of comparing the number of vaccinations with that of births, is, in the event of any child not being vaccinated within eight days after its birth, to give notice to the father or mother, or person having care of the child, to take the child to the medical officer or the practitioner appointed for vaccination ; and omission after such notice, to take the child to be vaccinated, as also to take it for inspection on the eighth day after vaccination, renders the party liable to a penalty of twenty shillings.

A moment's reflection will show, that for the purpose of coercion the law is insufficient. The only person who has the means of ascertaining whether vaccination has taken place on every birth is the Registrar of births and deaths, who, by comparing the register of births with the medical certificates of vaccination, is at once able to ascertain whether vaccination has in any case been omitted. Unfortunately, the supervising control of this officer is confined to giving the notice already referred to at the end of eight days from the birth. The Act, however, allows three months to the parents, and four to a person having the care of a child, to fulfil the requirements of vaccination. But no further duty

is cast on the Registrar, or, indeed, on any one else, of instituting any inquiry to see whether all children born in the district have, in fact, been vaccinated. Again, although the Act imposes a penalty, there is no one whose duty it is to enforce it in case of disobedience. The consequence of these omissions is, that to a great extent the Act remains a dead letter. Now, I would venture to suggest that a duty should be imposed on the Registrar of comparing the register from time to time with the certificates of vaccination, and of reporting to the parish officers the cases in which vaccination has been neglected; and that a duty should be cast on these last-mentioned officers to summon the offending parties before magistrates, with a view to their conviction and the infliction of the penalty. It may also well be questioned, whether the maximum of the penalty is not too low; and whether provision ought not to be made for a further conviction, with increased penalties, on non-compliance within a further short period; and so from time to time, until the law has been obeyed.

No reasonable objection, it is apprehended, can be raised to coercive legislation in a matter so vitally affecting the well-being of the whole body of the community. Infants, unable to secure to themselves the means of future safety, are entitled to be protected against the possible neglect or culpable indifference of parents. Where the safety of all is involved, it cannot be questioned that the State is justified in interfering with the freedom of individual action to insure the common safety, and protect the whole body of society from the danger of pestilence and death.

The Registrar-General of Scotland informs us, that

“in consequence of the apathy or ignorance of many of the lower classes, the present epidemic of Smallpox has found numerous victims everywhere, quite unprotected by vaccination; and the spread of the disease among these, in its most virulent forms, has kept up the infection in certain localities, and caused them to act like new centres of contagion, long after the disease would otherwise have passed away. This is one of the general evils of having a large number of unvaccinated persons among us; we are courting a plague which, after it breaks out among the unprotected, increases its contagious virulence, till it attacks all susceptible of receiving it.” A statement supported by such authority is surely sufficient to prove the paramount importance of efficient legislative coercion in such a matter.

It is unnecessary to dwell further on this branch of the subject. The principle is sufficiently recognised in the legislation which has already taken place in this behalf.

From what has been said in these pages, the following practical conclusions may, it is submitted, be drawn. Vaccination, if properly conducted, may be made the means, if not of actually extirpating Smallpox, at all events of reducing that disease within such narrow limits, as that it shall no longer be a source of general danger and alarm. To attain this great result, certain conditions are necessary:—that the process of Vaccination shall be conducted by practitioners perfectly acquainted with, and careful to observe the requisites essential to its success; that the lymph used shall be of perfect quality; that Vaccination shall be, without exception, universal. We are further warranted in con-

cluding, that the unsuccessful results of Vaccination, and the consequent increase of Smallpox, are to be ascribed to unscientific administration of the remedy, either in the use of imperfect lymph, or in inattention to the indications from which alone a successful result may be assumed to have been secured,—to the want of universal use of Vaccination, either owing to a deficiency of lymph, or to the absence of a thoroughly effectual system of coercive medical police.

On the other hand, we may comfort ourselves with the conviction, that the remedy is within our own power. The praiseworthy measures recently taken by the Government for securing in future the thoroughly scientific performance of Vaccination, will, it may be hoped, insure that important desideratum. The use of lymph taken from imperfect sources will be checked, when practitioners have become impressed with the necessity of discriminating between the perfect and imperfect, and have acquired by proper training the power of judging between them. Above all, experiment and science having established the fact that, by passing the virus of smallpox through the body of the cow, the virus of cowpox may be artificially obtained, identical in characteristic properties with that obtained from the spontaneous disease of the animal, a supply of fresh and perfect lymph may be at all times procured commensurate with the public requirement. Lastly, there seems no reason to doubt, that a slight amendment only of the law will suffice to insure the uniform practice of Vaccination throughout all classes of the people.

While, therefore, we ought not to shut our eyes to the fact that the recent increase of Smallpox affords a well-founded ground of public anxiety, and is sufficient

to call for the vigilant attention of those whose province it is to watch over the sanitary condition of the country, yet, on the other hand, we may rest assured that there is no reason for despondency, or ground to doubt that, by the application of prompt and energetic measures, wholly within our power, the efficiency of Vaccination may be established in all its integrity ; and so, the dire calamity of epidemic Smallpox may, under the blessing of Providence, be averted from this and future generations.

